

CONTENTS

I. Introduction	2
II. Installation	4
III. Clinical Instructions	7
3.1 Monitoring During Anesthesia	7
1. ECG and Core-body Temperature	8
2. Pulse Oximetry	9
3. Airway-direct Respiration (VSM8-A and VSM8-B)	12
4. Blood Pressure Monitoring (optional)	13
5. Mainstream Capnography (optional)	17
3.2 ECG Testing	25
3.3 BP Measurements (optional)	27
IV. Operational Instructions	28
4.1 Control Panel	30
4.2 Menu System	31
4.3 Recall Data	37
4.4 Save Information	37
4.5 Review Saved Information	38
1. Install the software on computer	38
2. Transfer data and organize files	43
3. Open the program	45
4. View and print monitoring records	46
5. View and print ECG	52
4.6 Troubleshooting	53
V. Maintenance	56
VI. Accessories	57
VII. Technical Support	59
Limited Warranty	60

I. Introduction

The VetSpecs® VSM8 vital signs monitor, the flagship model of VetSpecs® monitors, is developed specifically for vital signs monitoring during anesthesia, ECG testing, and blood pressure measurements in cats, dogs, and other similar-sized veterinary patients.



1. Upgradeable Digital Platform

	VSM8-A	VSM8-B	VSM8-C	VSM8-D	VSM8-E
ECG (with esophageal probes)	S	S	S	S	S
Core-body Temperature	S	S	S	S	S
Pulse Oximetry	S	S	S	S	S
Airway-direct Respiration	S	S	-	-	-
Mainstream Capnography	O	O	S	S	S
Noninvasive Blood Pressure	O	S	O	S	S
Invasive (direct) Blood Pressure	O	O	O	O	S

S - Standard.

O - Optional external module which can be added on without returning the monitor to VetSpecs.

The VSM8 incorporates VetSpecs® state-of-the-art digital modular platform with five configurations to choose from (see the table above). You can purchase a system which is best suited for your monitoring needs, and upgrade the monitor later to meet your growing clinical needs.

The digital mainstream capnography (CO₂) function, noninvasive blood pressure (NIBP) function, and invasive (direct) blood pressure (IBP) function, each comes as a separate external module. If your VSM8 did not come with CO₂, NIBP, and/or IBP functions, you can add them at any time by purchasing the needed modules. Then, all you need to do is to simply connect the modules to the monitor. There will be no need to return your VSM8 to VetSpecs for the upgrade.

2. Comprehensive Monitoring

The VSM8 provides comprehensive monitoring for your patients under anesthesia. With the VSM8, you monitor the patient's ventilation with mainstream capnography or airway-direct respiration, its circulation with noninvasive or invasive (direct) blood pressure, its oxygenation with pulse oximetry, and its ECG and core-body temperature with an esophageal probe.

3. Digital Documentation - Go Paperless

The VSM8 automatically saves monitoring records (waveforms, readings, and trends), ECG tracings, and blood pressure readings on a USB flash drive for easy transfer of saved information to computers. You can then review the information, print out through any office laser or ink-jet printers (with 8.5"X11" plain papers), and integrate the data to the patient's file using your existing veterinary practice management software.

II. Installation

1. Multi-parameter module

Connect the multi-parameter module (hereinafter “the Module”) to the port labeled CO2/SPO2/ECG/Resp./Temp. on the right side of the monitor.

The monitor displays MODULE OFF in the areas for HR (green), SPO2 (red), and RR (yellow), when the Module is not connected to the monitor. Upon connecting the Module, MODULE OFF in all three areas go away.

It is suggested to hang the Module onto the anesthesia machine with the attached string, or affix the Module to a proper place with the attached Velcro strip.

2. Esophageal probes

The VSM8 comes standard with a set of three esophageal probes. The one labeled CAT is for kittens, cats, and very small dogs. The one labeled Small Dog is for small to medium dogs. The one labeled Large Dog is for medium to large dogs.

The esophageal probes are to be connected to the Module.

3. ECG leads with flat clips

The VSM8 comes standard with one set of ECG leads (green, red, and white) with flat clips. The ECG leads are to be connected to the Module.

4. SpO2 sensors

The VSM8 comes standard with one SpO2 lingual sensor (Gray clip) and one SpO2 leg/toe sensor (Blue clip). The SpO2 sensors are to be connected to the Module. Upon connecting a SpO2 sensor, PROBE OFF goes away.

5. Airway Sensors (VSM8-A and VSM8-B)

The monitor comes with two airway sensors. The one labeled Dog Airway Sensor is for use in medium to large dogs while the one labeled Cat/Small Dog Airway Sensor is for use in kittens, cats, puppies, and small dogs.

The airway sensors are to be connected to the Module. Upon connecting an airway sensor, SENSOR OFF goes away.

6. NIBP module and accessories (optional)

The optional NIBP function consists of a NIBP module, a BP tube attached to the NIBP module, two BP sensor bands (one short and one long), and six cuffs of different sizes.



BP Sensor Bands

Connect the NIBP module to the BP port on the right side of the monitor.

The monitor displays MODULE OFF in the NIBP area (blue) when the NIBP module is not connected to the monitor. Upon connecting the NIBP module, MODULE OFF goes away.

The BP sensor bands are to be connected to the NIBP module. Upon connecting a BP sensor band, a blue bar graph appears in the NIBP area. When the BP sensor band is not applied to the patient, the monitor may be flashing BP SENSOR OFF.

The cuffs are to be connected to the BP tube on the NIBP module.

7. CO2 module and its airway adapter (optional)

The optional mainstream capnography function consists of a CO2 module, labeled VetSpecs® Mainstream CO2 Sensor, and a clear airway adapter inserted on the CO2 module (sensor).

The CO2 sensor is to be connected to the Module. The monitor displays MODULE OFF in the CO2 area (yellow), when the CO2 sensor is not connected to the monitor. Upon connecting the CO2 sensor, the monitor displays CAL and CO2 CALIBRATION.

8. USB flash drive and its extension cable

The VSM8 monitor comes with a USB flash drive and a USB extension cable (connected to the flash drive). Connect the extension cable (with the flash drive) to the USB port on the back of the monitor. The monitor displays at the bottom of the screen DISK:None when no flash drive is plugged in, and DISK:Ready when a flash drive is connected.

9. Connecting the power

Plug the power cord into the power port on the back of the VSM8, and then into a 3-line power outlet. For maximum safety, only connect the VSM8 to a power outlet with three lines.

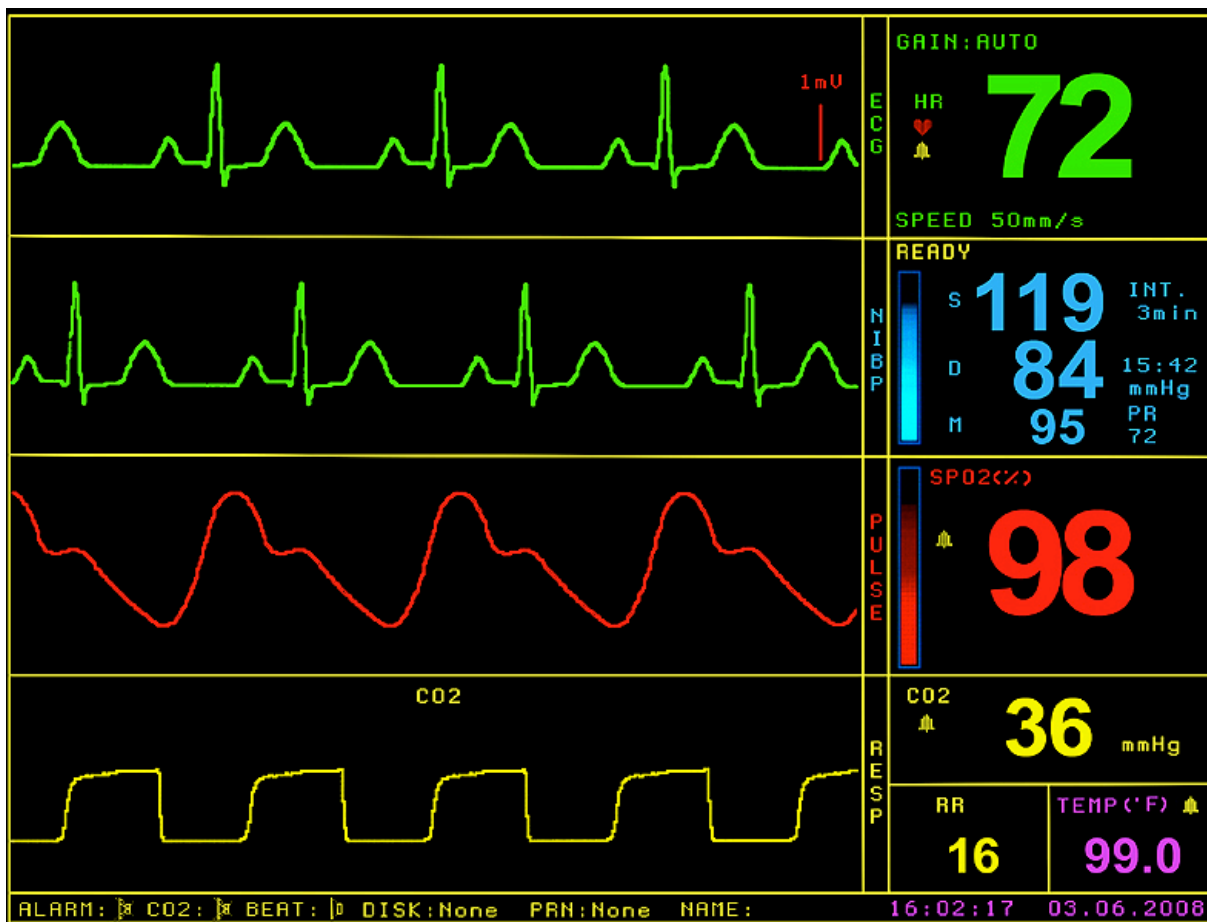
III. Clinical Instructions

3.1 Monitoring During Anesthesia

The VSM8 features three work modes: monitoring mode, ECG mode, and blood pressure (BP) mode.

The VSM8 automatically switches to monitoring mode when an esophageal probe is inserted into the patient, i.e. a temperature is registered, an airway sensor is connected to the monitor, or the CO2 sensor is connected to the monitor.

In monitoring mode, the VSM8 displays cascaded two lines of ECG (green), one line of pulse waveforms (red), and one line of respiratory waveforms (white) or one line of CO2 waveforms (light yellow).



Monitoring mode

1. ECG and Core-body Temperature

The VSM8 registers ECG, heart rate (HR), and core-body temperature in anesthetized patients with an esophageal probe.

A. Choose an appropriate sized esophageal probe

The esophageal probe labeled Large Dog is for medium to large dogs. The esophageal probe labeled Small Dog is for small to medium dogs. The esophageal probe labeled CAT is for kittens, cats, and very small dogs. The esophageal probe labeled Exotics (optional) is for lizards and snakes.

In order for the probe to register ECG, all three metal rings must establish good contacts with the esophagus. If the probe is too small for the patient, it will not be able to establish good contacts with the esophagus. **Applying the CAT probe in medium or large dogs may produce erratic ECG and inaccurate HR.**

B. Apply the esophageal probe

After the patient has been anesthetized and intubated, estimate how deep to insert by laying the probe on the patient. The distal ring and middle ring should be positioned across the heart after inserted. Mark the probe at the mouth level with your hand, slide the probe into the esophagus to the estimated depth, and then watch the screen. If ECG is erratic, adjust the depth of the probe until stable ECG is registered. Motions induced to the patient or the probe may produce motion artifacts on the ECG. Tie the esophageal probe to the endotracheal tube to minimize motions if necessary.

Never insert a probe into a patient not anesthetized and intubated. Do not use a probe which is defective or damaged externally. **When using the esophageal probes in electrosurgery, the patient must be properly grounded as instructed in the User's Manual for the electrosurgical unit being used.**

2. Pulse Oximetry

A. Connecting the SpO2 sensor

The monitor flashes PROBE OFF when no SpO2 sensor is connected to the monitor. Connect a SpO2 sensor to the Module. PROBE OFF goes away.

B. Applying a SpO2 sensor

1. SpO2 Lingual Sensor (Gray clip)

The lingual sensor is intended for use **only** on the tongue. Place the sensor at the center of the tongue, with the light-emitting side on top of the tongue. The lingual sensor may not work effectively at any other locations on the patient.

2. SpO2 Leg/toe Sensor (Blue clip)

Use the leg/toe sensor only when the lingual sensor is not suitable for the procedure.

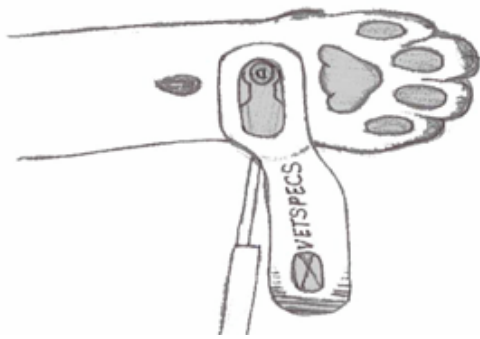
For cats, place the leg/toe sensor on

- A leg between the carpal pad and the metacarpal pad, with the light going through the leg from front to back, see Sketch 1. If the sensor site is covered with dark hair, clip the hair on both sides of the leg.
- A paw with the light-emitting side on top of the paw and the other side of the sensor on top of the metacarpal pad, see Sketch 2.

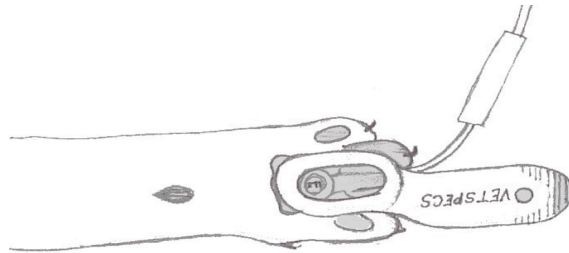
For dogs, place the leg/toe sensor on

- A leg at the Achilles tendon, see Sketch 3.
- A toe side to side, see Sketch 4. If possible, apply the sensor to a toe with light skin. If the toe is covered with dark hair, clip the hair on both sides.
- A leg front to back between the carpal pad and metacarpal pad, see Sketch 1.

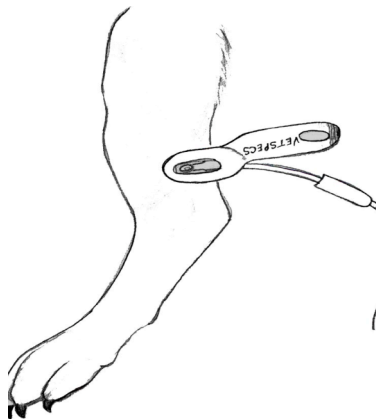
Never place the leg/toe sensor on the tongue. Applying the leg/toe sensor to the tongue will cause vasoconstriction.



Sketch 1: The Leg/toe sensor on the distal portion of a cat's or small dog's leg.



Sketch 2: The leg/toe sensor on a cat's paw.



Sketch 3: The leg/toe sensor on the Achilles tendon of dogs.



Sketch 4: The leg/toe sensor on a toe of dogs.

C. Watch the waveforms

After the sensor has been applied onto the patient for a few seconds, the VSM8 will display a line of pulse waveforms (red) and a pulsating bar graph (red), as well as a SpO2 reading. Both the waveforms and the bar graph are pulsating in synch with the heartbeats when the sensor is picking up valid arterial pulsations. **The SpO2 reading is accurate only when the waveforms and the bar graph are pulsating in synch with the heartbeats.**

After applying the lingual sensor, if the waveforms are erratic, the tissue underneath may be in a low perfusion condition. Verify the patient status, and try another site on the tongue. If the waveforms (or bar graph) become erratic during the monitoring, verify the patient status, and move the sensor to another spot on the tongue. After the sensor has been placed on one spot for an extended period of time, the effect of the pressure could build up to cause vasoconstriction in the tissue.

When using the leg/toe sensor, always place the sensor at a site with light skin if possible. To apply to a site with pigmented tissue, the hair on both sides must be clipped. Watch the waveforms. If the waveforms are a flat line or pulsating intermittently (the bar graph is barely moving), the site is too pigmented to permit adequate light transmission. Try another site.

It is highly recommended to simultaneously use both the ECG function and the SpO2 function when monitoring during anesthesia. When both the SpO2 channel and the ECG channel are working properly, and the patient's condition is normal, the pulse waveforms and ECG are in synch with each other. **However, if registered pulse waveforms and ECG are not in synch with each other, a red flashing question mark (?) will be displayed (near the heart rate).** Check both the pulse waveforms and the ECG. If one or both are erratic, verify the patient status, and adjust the placement of the SpO2 sensor and/or the esophageal probe. The red flashing question mark (?) will stay on until the two are in synch with each other again. This feature ensures that both the ECG and the SpO2 function are working properly during the monitoring.

3. Airway-direct Respiration (VSM8-A and VSM8-B)

The VetSpecs® proprietary airway-direct respiration technology provides real-time respiratory waveforms, a respiratory rate (RR), and a respiratory sound. The monitor comes with two airway sensors. The one labeled Dog Airway Sensor is for medium to large dogs. The one labeled Cat/Small Dog Airway Sensor is for cats and small dogs.

The monitor flashes SENSOR OFF when no airway sensor is connected to the monitor. Connect an airway sensor to the Module. SENSOR OFF goes away, and the monitor displays 00 or 01 at the RR.

After the patient has been intubated, insert the airway sensor between the endotracheal tube and the breathing circuit. Respiratory waveforms (white) and a RR are displayed.

The airway-direct respiration also offers a digital respiratory sound, which allows you to continuously assess the patient's respiratory status without constantly watching the screen. The respiratory sound can be set ON or OFF in the menus, and the setting will be saved as default.

If the patient has stopped breathing for longer than the apnea time set by the user, an alarm will be sounded. To push the ALARM key only suspends the apnea alarm for one minute.

After a monitoring, disconnect the airway sensor from both the endotracheal tube and the breathing circuit.

4. Blood Pressure Monitoring (optional)

A. The concept

Blood pressure (BP) is the lateral force per unit area exerted on a vessel wall. The pressure generated is pulsatile and creates a wave of vascular distention. This forward-moving pressure wave has maximum (systolic arterial pressure) and minimum (diastolic arterial pressure) values oscillating around a mean value (mean arterial pressure), which is the average pressure throughout the cardiac cycle that pushes blood through the vascular network. Since systole is normally shorter than diastole, mean arterial pressure (MAP) is not simply the midpoint between systolic arterial pressure (SAP) and diastolic arterial pressure (DAP) but is estimated as

$$\text{MAP} = \text{DAP} + (\text{SAP} - \text{DAP}) \div 3$$

The VSM8 offers a breakthrough noninvasive blood pressure technology, called the Volume Plethysmographic Method (VPM), which shares the same principle as the Doppler Method. The VPM employs an inflatable cuff to occlude arterial flow and a sensor band to sense arterial pulsations. It provides systolic, diastolic, and mean arterial pressures, and a continuous real-time pulse rate.

B. Choose an appropriately sized cuff

The VSM8 comes with six cuffs of different sizes. All six cuffs are marked to aid in proper cuff selection. When a cuff is wrapped around a site, its index edge should be within the range indicated on the cuff. The cuff is too small or too large if the index edge is outside the range. The following should be used only as general guidelines for cuff selections, because the circumference and shape of the cuff site, not the size of the patient, matter most.

- Size 1 (circumference 4.3 – 6.4 cm) is for kittens and very small dogs.
- Size 2 (circumference 5.9 – 8.7 cm) is for kittens, cats, and small dogs.
- Size 3 (circumference 7.2 – 10.7 cm) is for cats and small dogs.
- Size 4 (circumference 8.5 – 12.7 cm) is for small to medium dogs.
- Size 5 (circumference 9.0-15.0 cm) is for medium to large dogs.
- Size 6 (circumference 15.0-21.5 cm) is for large dogs.

Cuff size can have a significant influence on the accuracy of a measurement. A cuff that is too narrow will produce artificially elevated readings, while a cuff that is too wide will produce spuriously low values.

C. Choose an appropriately sized sensor band

The VSM8 comes with one long sensor band and one short sensor band. Generally speaking, the long sensor band is for medium and large dogs, while the short sensor band is for cats and small dogs. **When applying a sensor band to a site on the patient, the sensor band must allow it to be wrapped tightly around the site. Otherwise, the sensor band is too large to work properly for the site. Apply the short sensor band or try a site with a larger circumference.**

D. Apply the cuff and sensor band

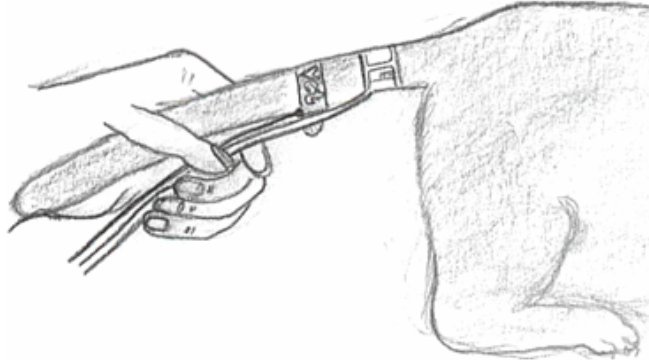
The cuff and the sensor band must be applied onto the same limb or tail. It is not necessary to clip the hair. Apply the cuff, and then the sensor band. **The sensor band must be placed distal to (below) the cuff. Place the sensor band over a main artery with the side labeled VetSpecs® facing out. Pull the Velcro strip to wrap the sensor band firmly, but not too tight.** The sensitivity of the sensor band will be reduced if the sensor band is not wrapped firmly or positioned correctly.

In order for the cuff to successfully occlude the arterial flow when inflated, the cuff must be placed at an appropriate site, as instructed below.

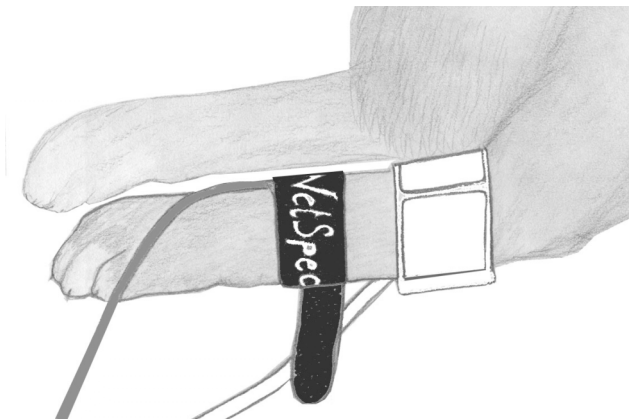
- Place the cuff at the base of the tail and the sensor band half of an inch below the cuff. Position the sensor band over the median coccygeal artery, see sketch 5. Pull the Velcro strip to wrap the sensor band firmly. **The tail placement is highly recommended for patients with short legs and for conscious patients, especially cats. Cats tolerate much better the tail placement.**
- For cats or dogs with long hind legs, the cuff may be placed below the hock and the sensor band half of an inch distal to the cuff. **Do not place the cuff above or on the hock.** The rear leg placement may not be suitable for patients with short hind legs.
- Place the cuff and the sensor band between the elbow and the carpus with the sensor band about one inch distal to the cuff, see sketch 6. Lay the patient in lateral

recumbence to minimize the effect of gravity. **Conscious cats usually do not tolerate well the foreleg placement.**

Do not place the cuff on or above the hock or elbow. The cuff will not be able to occlude the arterial flow if placed too high on a limb.



Sketch 5: Place the cuff at the base of the tail and the sensor band half of an inch below the cuff. Position the sensor band over the median coccygeal artery.



Sketch 6: Place the cuff and the sensor band between the elbow and the carpus, with the sensor band one inch distal to the cuff. Lay the patient in lateral recumbence to minimize the effect of gravity.

E. Watch the bar graph

The VSM8 displays a systolic arterial pressure (S), diastolic arterial pressure (D), mean

arterial pressure (M), real-time pulse rate (PR). Measurement interval (INT.) is also displayed on the screen. The arterial pulsations registered by the sensor band are displayed as a pulsating bar graph (blue).

After applying the cuff and the sensor band, watch the bar graph. The bar graph pulsates in synch with the heartbeats when the sensor band is picking up valid arterial pulsations. If the bar graph is jumping up and down erratically, the sensor band is picking up motions, rather than valid arterial pulsations. **In order to perform BP measurements, a valid pulse rate has to be registered first.** The VSM8 will continue to display WAIT... until a valid pulse rate is displayed. When the sensor band is picking up valid arterial pulsations, a valid pulse rate will be displayed in seconds, and at the same time READY will be displayed, indicating it is ready for BP measurements. **No BP measurements can be started before READY is displayed.**

If the bar graph is erratic (not in synch with the heartbeats), there may be repetitive motions induced to the patient, or the sensor band is not working properly. Test the sensor band on your finger. For the short sensor band, wrap it firmly on your index finger. For the long sensor band, wrap it firmly on your index and middle fingers together. If the bar graph pulsates vigorously and in synch with your heartbeats, the sensor band is good. Try it again on the patient. If the bar graph is also erratic, the sensor band needs to be replaced.

When the NIBP module registers no signals, the VSM8 will flash BP SENSOR OFF, indicating one of the three situations: (1) no sensor band is connected to the NIBP module; (2) the sensor band is not applied to the patient; or (3) the sensor band was worn out. If the monitor flashes BP SENSOR OFF while the sensor band is applied on the patient, tap the sensor band with your finger. If BP SENSOR OFF does not go away, the sensor band needs to be replaced.

F. Start a measurement

BP measurements can be started manually or automatically at a user-set interval. To manually start a measurement, push START/STOP key while READY is displayed.

The VSM8 rapidly inflates the cuff to around 280 mmHg, and then deflates gradually. The real-time cuff pressure count down is displayed in the NIBP area. The deflation process takes only a few seconds. The bar graph will resume pulsating when the pressure inside the cuff equals the systolic arterial pressure, indicating the return of arterial flow. Upon completing the measurement, systolic, diastolic, and mean arterial pressures are displayed. The time at which the measurement was completed is also displayed.

Between measurements, if motions are induced to the patient, the VSM8 may display WAIT...until the sensor band is again picking up valid arterial pulsations. If pushing START/STOP key while WAIT... is still displayed, a measurement will not be started until READY is again displayed. To abort a measurement, push START/STOP key.

The bar graph should stop pulsating immediately after the cuff inflation, indicating an occlusion of the arterial flow. If the bar graph keeps pulsating immediately after the cuff inflation, indicating a failure to occlude the arterial flow, no BP readings will be registered for the measurement, and OCCLUSION FAILED will be flashing on the screen. If you see OCCLUSION FAILED is displayed, verify the cuff placement and size. Make sure that (1) the cuff is applied correctly, (2) the cuff is placed at an appropriate site, and (3) the cuff size is appropriate for the site. The VSM8 will keep flashing OCCLUSION FAILED until READY is displayed again. It is highly recommended to manually start the first measurement and watch the entire measurement process closely. Set the VSM8 to automatically perform BP measurements only after you have confirmed that the cuff can successfully occlude the arterial flow.

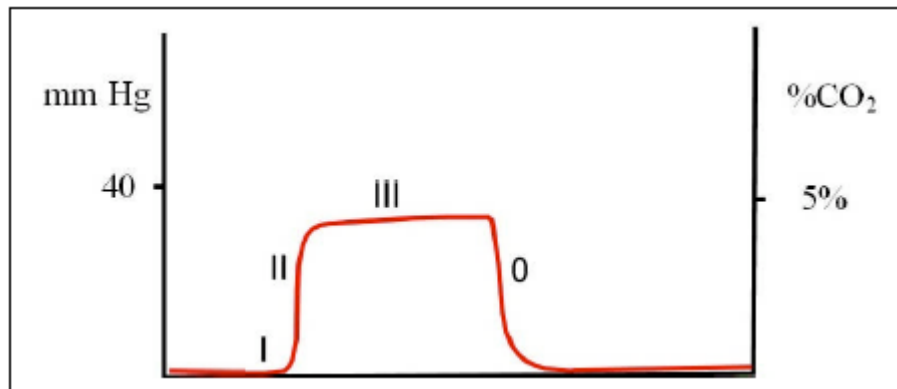
5. Mainstream Capnography (optional)

A. The concept

Capnography is measurement and waveform display of CO₂ concentration at the

patient's airway. It monitors various components of patient and anesthesia circuit/equipment as well as the critical connection between the two. A capnogram is the graphical waveform depicting CO₂ concentration throughout respiration. End-tidal CO₂ (ETCO₂), which can be expressed as mmHg or percentage, refers to the measurement of CO₂ concentration at the end of exhalation.

The normal range of ETCO₂ for most mammals is 30 – 45 mmHg or 4.0 – 5.5%. It is considered to be abnormal when the ETCO₂ is higher than 50 mmHg (or 6.5%) or lower than 20 mmHg (or 2.5%). The diagram below shows the shape of a normal capnogram.



Phase I: A near zero baseline — Exhalation of CO₂-free gas contained in dead space.

Phase II: Rapid, sharp rise — Exhalation of mixed dead space and alveolar gas.

Phase III: Alveolar plateau — Exhalation of mostly alveolar gas. At the end of exhalation, CO₂ concentration reaches the peak - end-tidal CO₂ value.

Phase 0: Rapid, sharp down-stroke — Inhalation.

Mainstream capnography provides real-time CO₂ waveforms, an ETCO₂ reading, a RR, and a respiratory sound. Unlike side-stream or micro-stream capnography, mainstream capnography performs CO₂ measurements directly inside the airway, withdrawing no gas away from the airway.

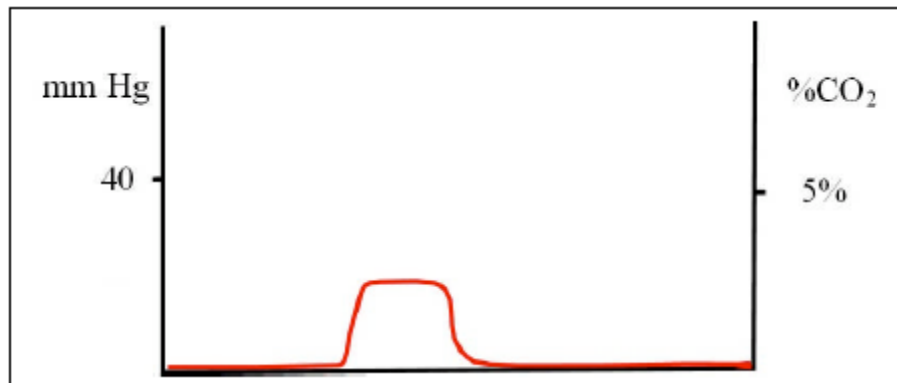
B. Clinical implications

Normal ETCO₂ readings, together with a normal capnogram, indicate normal function of the patient's metabolism, circulation, and ventilation, and of the anesthetic machine. Increases in ETCO₂ may be due to anesthetic induced respiratory depression,

increased metabolism, or the addition of CO₂ to the circulatory system as a result of re-breathing CO₂. Re-breathing CO₂ can be due to soda lime exhaustion or incompetent expiratory valve on the anesthetic machine allowing exhaled CO₂ to be re-inhaled. Decreased or abolished end-tidal CO₂ may be due to hyperventilation, low cardiac output, respiratory arrest, or cardiac arrest.

Capnogram also provides vital information regarding the patient's airway potency. A depressed or absent capnogram may be due to a dislodged, misplaced, or obstructed endotracheal tube or airway, a leak around endotracheal tube cuff or, disconnection of the endotracheal tube from the anesthetic machine. The following are examples of abnormal capnograms.

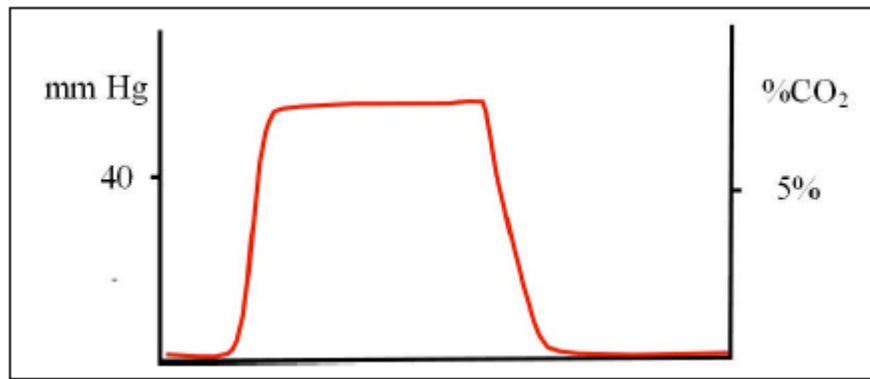
1. Low readings



If ETCO₂ readings are consistently below 20 mmHg (or 2.5%), look for the following causes:

- Increased respiratory rate
- Excessive mechanical ventilation – minute volume ventilation too high
- Reduced cardiac output – failure to deliver CO₂ to the lungs
- If the animal is intubated, check there are no leaks around the tube (dilution)
- Decreased metabolic activity – e.g. hypothermia

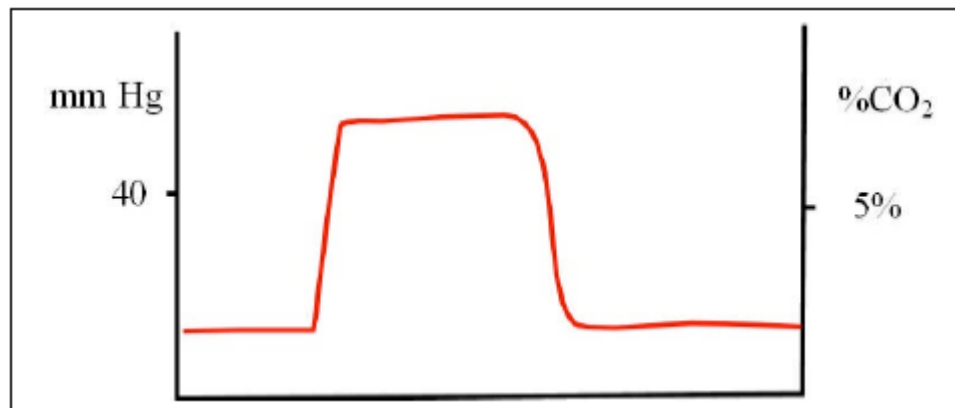
2. High readings



If ETCO₂ readings are consistently above 50 mmHg (or 6.5%), look for the following causes:

- Decreased respiratory rate
- Insufficient mechanical ventilation – minute volume ventilation too low
- Increased metabolic activity – shivering, hyperthermia

3. Rise in base-line caused by increased levels of inspired CO₂

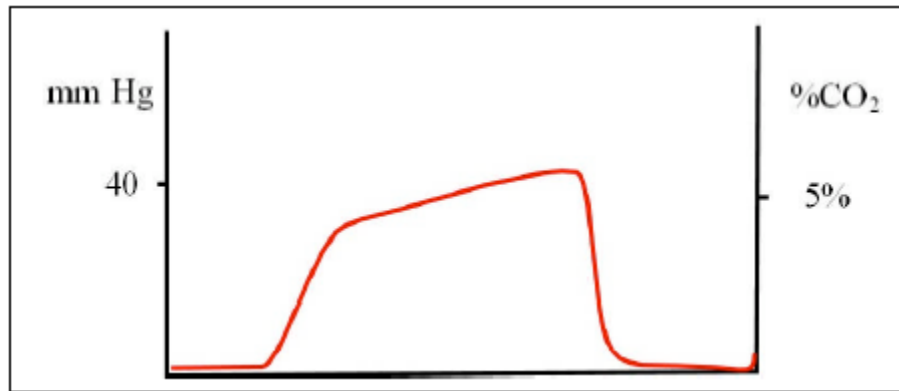


Possible causes:

- Insufficient fresh gas flow in non-rebreathing circuit
- Excessive dead space in anesthetic circuit
- Exhausted soda-lime in rebreathing circuit

Note that at the same time the ETCO₂ value will also start to rise.

4. Increase in the slope of phase II and phase III



Possible causes: Reduced ability to expire – e.g.

- Block ET tube
- Bronchial disease / asthma
- Upper airway obstruction
- Faulty expiratory valve

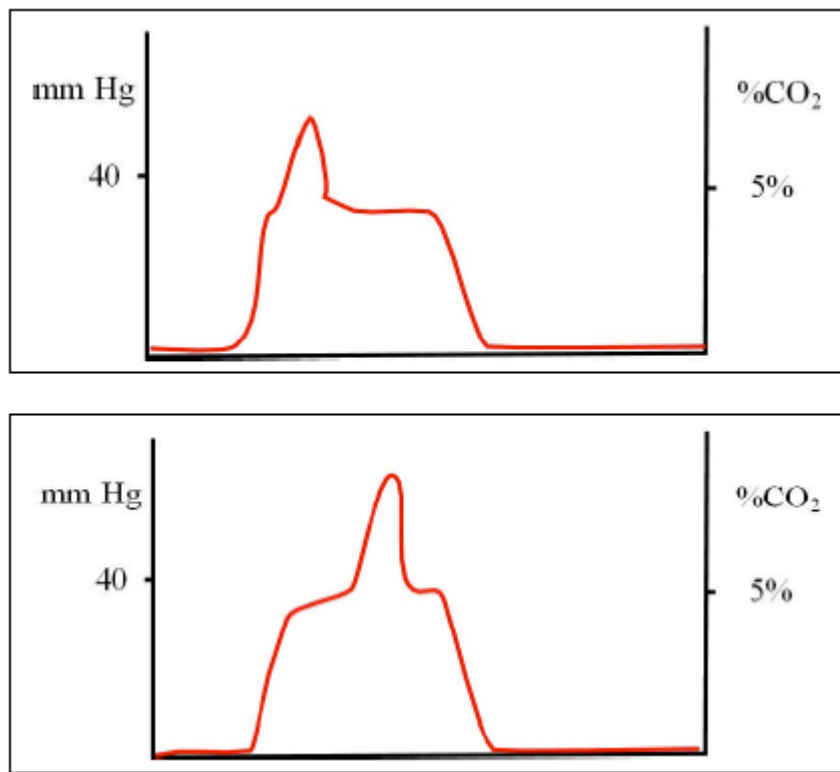
5. Abrupt fall in ETCO2 level



Possible causes: any effect leading to sudden reduced cardiac output

- Pulmonary artery compression
- Pulmonary artery embolism
- Sudden hemorrhage
- Acute cardiac tamponade
- Cardiac compression

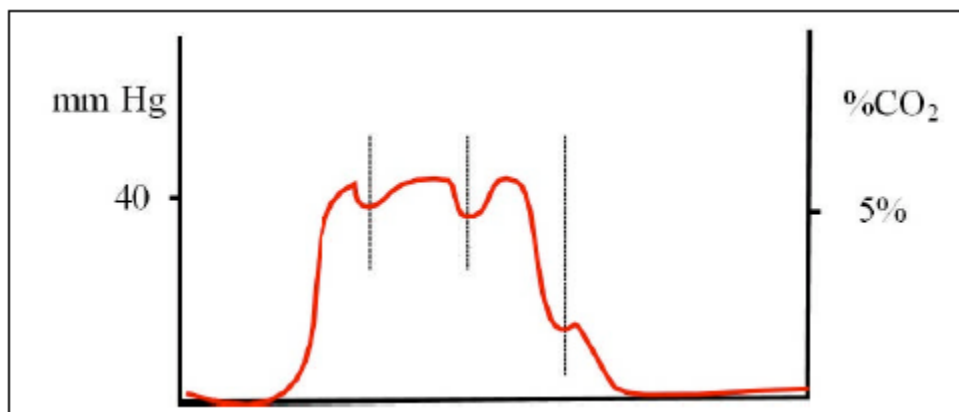
6. Differential emptying



The above capnograms can result from the following:

- Positioning of the ET tube at or beyond the carina, so that one side of the lung has impaired emptying. This makes the retained gas higher in CO₂ and later to empty than from the normal lung. The “spike” can occur anywhere in the plateau phase.
- Any functional blockage of a major airway, below the carina – foreign body, mucous, compressed airway, etc.

7. Cardiogenic oscillations



Cardiogenic oscillations are ripples superimposed on the expiratory plateau and the descending limb of the capnogram, which are caused by small gas movements inside

the airway. Although cardiogenic oscillations can occur in any animal where the pulsations of the aorta and heart cause areas of lungs to be compressed and thereby emptied and filled, they are typically seen in large dogs with a slow RR. The guide to the fact that this is happening is that the oscillations are in synch with the heartbeats. The displayed respiratory rate can be much higher than the actual respiratory rate when cardiogenic oscillations occur.

C. Operational instructions

1. Apply the CO2 sensor

Attach the airway adapter onto the CO2 sensor (as shown below), and then connect the CO2 sensor to the Module.



The CO2 sensor will automatically start to calibrate as soon as it is powered on. The VSM8 displays CO2 CALIBRATION and CAL. Upon completing the calibration, both CO2 CALIBRATION and CAL go away. The calibration process takes two minutes.

To ensure the CO2 sensor to be calibrated correctly, attach the airway adapter to the CO2 sensor (as shown above) before the sensor is being powered on, and do not connect the CO2 sensor to the endotracheal tube before the calibration process has been completed.

2. CO2 monitoring

The CO₂ waveforms indicate the real-time airflow in and out the patient. If the CO₂ waveforms are erratic, check the patient status and the placement of the endotracheal tube. Adjust the endotracheal tube and/or bag the patient if necessary.

If the patient has stopped breathing longer than the apnea interval set by the user, an alarm will be sounded. To push the ALARM key only suspends the apnea alarm for one minute.

After a monitoring, disconnect the CO₂ sensor from both the endotracheal tube and the breathing circuit.

D. Respiratory sound

The CO₂ function offers a digital respiratory sound, which allows you to continuously assess the patient's respiratory status without constantly watching the screen. The respiratory sound can be set ON or OFF in the menus, and the setting will be saved as default. The volume of the sound can be adjusted with the VOLUME Dial.

E. The airway adapter

The airway adapter is a semi-deposable item. After using for a period of time, it must be replaced due to the residuals accumulated inside the airway adapter. Do not try to clean the airway adapter as it may damage the special optical film on the two circular windows. Generally speaking, if the CO₂ function does not work properly, replace the airway adapter. It is recommended to replace the airway adapter at least twice once a month.

3.2 ECG Testing

The VSM8 comes with a set of ECG leads with flat clips, designed specifically for ECG testing in cats, dogs, and other similar-sized animals.

The VSM8 automatically enters into ECG mode when the ECG leads are applied to the patient and no CO2 sensor or airway sensor is connected to the Module. In ECG mode, the VSM8 displays cascaded four lines of ECG on one screen,



ECG mode

Attach the foreleg lead(s) to the appropriate foreleg just above the elbow and the rear leg lead(s) to the appropriate rear leg immediately proximal to the stifle. It is not necessary to clip hair. **Wet all three contact sites thoroughly with conductive agent, such as saline. In order to register interference-free ECG, adequate amount of**

conductive agent must be applied to all three contact sites.

With the ECG leads, the VSM8 can register Lead-I, Lead-II, or Lead-III ECG, but one Lead at a time. Lead-II is the Lead of choice for ECG monitoring, testing, and screening in veterinary patients because Lead-II offers the largest ECG tracings. Placements of leads (clips) for registering different Leads are listed as below:

LEAD-II ECG

GREEN lead attaches to RIGHT REAR LEG

RED lead attaches to LEFT REAR LEG

WHITE lead attaches to RIGHT FORELEG

LEAD-I ECG

GREEN lead attaches to RIGHT REAR LEG

RED lead attaches to LEFT FORELEG

WHITE lead attaches to RIGHT FORELEG

LEAD-III ECG

GREEN lead attaches to RIGHT REAR LEG

RED lead attaches to LEFT REAR LEG

WHITE lead attaches to LEFT FORELEG

The patient should be laid on its side, usually on a towel or rubber mat, and relaxed. Trembling and panting may produce motion artifacts on ECG.

For more information on ECG, refer to pages 37, 51, and 52.

3.3 BP Measurements (optional)

For more instructions, refer to pages 12 – 16, 36 – 37, 47 – 48, and 53.

The VSM8 automatically enters into BP mode when only the NIBP module is connected to the monitor. In BP mode, the VSM8 displays cascaded four lines of pulse waveforms (blue) registered by the BP sensor band.

1. Screening for hypertension

Screening for hypertension must be performed in a quiet environment under a stress-free condition. If possible, have two people to perform the procedure. One holds and calms the patient while the other places the cuff and the sensor band and then performs the measurements.

For cats, it is highly recommended to place the cuff and sensor band on the tail, see sketch 5 on page 14, as cats usually tolerate much better the tail placement.

Apply the cuff and the sensor band, and then calm down the patient. After the patient is calmed down, connect the cuff and the sensor band to the NIBP module, which should be placed close to the patient.

The patient must be calmed down before starting a measurement. Do not start a measurement when the patient is constantly struggling, panting, trembling, or shivering. No technologies can measure BP effectively when there are repetitive motions on the patient. Furthermore, it makes no sense to measure BP when the patient is obviously under stress.

Watch the bar graph. If the bar graph is pulsating erratically, i.e. it is not in synch with the heartbeats, the patient is not relaxed. Even when there are no visible body motions, the muscles underneath the sensor band may still be too tense, producing minute muscle movements. Continue to calm the patient. After the patient is calmed down, the bar graph will pulsate in synch with the heartbeats. As soon as READY is displayed, you can push the START/STOP key to start a measurement.

For BP screening, it is recommended to set the measurement interval at 1 minute or to manually start each measurement.

2. Systemic hypertension

The diagnosis of systemic hypertension may be made in a cat of any age with a systolic pressure over 190 mmHg. Cats with clinical findings compatible with hypertension and systolic pressures between 160–190 mmHg should also be considered hypertensive, particular in cats < 14 years old. In the absence of clinical findings of hypertension, cats with a systolic pressure between 160 – 190 mmHg should have measurements repeated many times over the course of a day. In general, dogs with a systolic pressure over 180 mmHg are considered hypertensive. Care has to be taken in diagnosing hypertension as marked breed differences occur. These are not absolute limits, just a guideline for each individual case. Repeated measurement helps clarify whether the elevation in pressure is sustained or stress-induced. Results always need to be interpreted carefully in light of the animal's condition and measurement environment. If the same patient is to be measured at different times, cuff size and position should be matched as close as possible.

3. BP measurements in hypotensive patients

In order for the sensor band to pick up valid arterial pulsations in hypotensive patients, place the sensor band at a site with better circulation, position the sensor band right above a main artery, and wrap the sensor band firmly. If necessary, clip the hair underneath the sensor band. If the sensor band cannot pick up valid arterial pulsations, try another location. The sensor band may not be able to pick up valid arterial pulsations when the circulation underneath is too weak. Failure to pick up arterial pulsations by the sensor band at multiple locations is an indication of severe hypotension.

IV. Operational Instructions

Push the purple POWER button on the back of the monitor to turn on or off the VSM8.

Sleep Mode

To extend the life of the screen, the VSM8 will automatically turn off the screen (sleep mode), after the monitor has been idle for more than 30 minutes. In sleep mode, the screen is turned off, but the green power light at the lower left corner is flashing. To exit sleep mode (turn the screen back on), simply push the Wake Up key (yellow) on the front panel, rather than push the POWER button on the back.

To turn the screen back on (exit sleep mode), push the yellow Wake Up key, not the POWER button.

If you mistakenly pushed the power button when the monitor was in sleep mode, you would need to wait 10 seconds with the power button at the UP position before pushing down the power button to turn on the monitor.

4.1 Control Panel

Wake Up

Push this key to exit sleep mode, turn the screen back on.

TREND

Push this key to display stored BP readings and trends, and back to waveforms display. TREND and Wake Up share the same key (yellow).

SAVE

In monitoring mode, push this key to make a screen capture, saving the information on the screen to the flash drive.

♥BEAT

Push this key to turn off or on the heartbeats sound.

FREEZE

Push this key to freeze a line of ECG on the screen. Push it again to release the line.

START/STOP

Push this key to manually start a BP measurement. Push it again before a measurement has completed aborts the measurement.

ALARM

Push this key to turn on or off an audible alarm. However, apnea alarm can be suspended for only 60 seconds.

JOG DIAL

Push the JOG DIAL to display main menu. Turn the JOG DIAL to select items in main menu or submenus.

VOLUME

Turn this dial to increase or decrease the volume of the speaker.

4.2 Menu System

Main menu

Push the JOG DIAL to display main menu (as shown below). Turn the JOG DIAL to select a submenu, and then push the JOG DIAL to enter. To exit from main menu, select ESC and push the JOG DIAL.

1. Name:
2. CO2&Resp
3. SCREEN
4. NIBP
5. ECG
6. SPO2
7. Temp.
8. SETUP
9. ESC

Name

The VSM8 will prompt you to enter a patient name upon turning on the power with at least one module connected to the monitor. The monitor will beep for 10 seconds and keep flashing NAME: until a name is entered. **You can enter a name only when DISK:Ready is displayed and NAME: is flashing.**

The name on the screen will be canceled when the monitor switches work modes, for example from ECG mode or BP mode to monitoring mode. Therefore, for monitoring, do not enter a name until the monitor is in monitoring mode.

To enter a patient name, push the JOG DIAL to select NAME: and then

- Push the JOG DIAL again to generate a red cursor, rotate the JOG DIAL to input the first letter (A to Z) or digit (0 – 9), and then push the JOG DIAL to enter.
- Rotate the JOG DIAL to input the second letter or digit, and then push the JOG DIAL to enter. A total of eight letters and/or digits can be entered.
- After entering the name, push the JOG DIAL until the red cursor disappears.

The name is displayed at the bottom of the screen, and a new folder under the name is created on the flash drive.

No new folder will be created on the flash drive until a new name is entered. Upon entering a new name, BP readings and trends data already stored in the internal memory of the VSM8 will be erased, making the monitor ready for the new patient. **The information already saved on the flash drive will not be deleted.**

If a folder with the same name has already existed on the flash drive, the word “EXISTED” will be displayed briefly upon entering. Enter a different name, or go to a computer to delete the folder with the same name from the flash drive.

If you do not want to save any information for a procedure, just do not enter a name.

CO2&Resp

- In main menu, select CO2&Resp and then push the JOG DIAL to enter:

1. Sound: OFF
2. Apnea: 30 S
3. Unit: mmHg
4. HI: 50
5. LO: 20
6. Alarm: ON
7. Speed: Slow
8. RETURN
9. ESC

The VSM8 offers a digital respiratory sound. The respiratory sound can be set OFF or ON as default. To turn on or off the respiratory sound,

- Select SOUND: OFF, and push the JOG DIAL to highlight in red.
- Turn the JOG DIAL to change to ON, and then push the JOG DIAL to set.

If the patient has stopped breathing for longer than the apnea time set by the user, an alarm will be sounded. The default apnea time is 30 S. To change it, highlight in red, and then turn the JOG DIAL.

The end-tidal CO₂ can be expressed as mmHg or percentage (%). The user can select one of the two units and set it as default. To change the unit:

- Select units: mmHg, and push the JOG DIAL to highlight in red.
- Turn the JOG DIAL to change the unit, and then push the JOG DIAL to set.

To change end-tidal CO₂ alarm limits:

- Select the item to be changed, push the JOG DIAL to highlight in red.
- Turn the JOG DIAL to change the number, and push the JOG DIAL to set.

The default alarm setting for end-tidal CO₂ is ON. To change the alarm setting to OFF:

- Select Alarm: ON, and push the JOG DIAL to highlight in red.
- Turn the JOG DIAL to change to OFF, and then push the JOG DIAL to set.

The CO₂ waveforms have two speeds: Fast and Slow. To change waveform speed:

- Select Speed: Slow, and push the JOG DIAL to highlight in red.
- Turn the JOG DIAL to change to Fast, and then push the JOG DIAL to set.

SCREEN

- Select SCREEN and push the JOG DIAL to enter SCREEN submenu as below:

1. WAVE
SPEED: 50 mm/s
2. NIBP
PAGE: 1/1
3. TREND: 1h
4. RETURN
5. ESC

A. WAVE

The ECG and pulse waveforms have three speeds: 25, 50 (default), and 100 mm/s.

- Select SPEED: 50 mm/s, and then push the JOG DIAL to highlight in red.

- Turn the JOG DIAL to change the speed, and then push it to set.

B. NIBP

With the NIBP module connected to the monitor,

- Turn the JOG DIAL to select PAGE: 1/1, and then push the JOG DIAL. The first page of stored BP readings will be displayed on the screen.
- Turn the JOG DIAL to change page numbers. Push the JOG DIAL to return to waveforms display.

C. TREND

- Turn the JOG DIAL to select TREND: 1h, and then push the JOG DIAL. The trends of the last one hour (1-hour trends) will be displayed on the screen.
- Turn the JOG DIAL to change between the 1-hour trends and the 4-hour trends. Push the JOG DIAL to return to waveforms display.

NIBP

With the NIBP module connected to the monitor, select NIBP and push the JOG DIAL to enter NIBP submenu as below:

1. Interval
3min
2. Alarm: OFF
3. SAP HI: 180
LO: 60
4. DAP HI: 120
LO: 40
5. MAP HI: 150
LO: 50
6. RETURN
7. ESC

A. INTERVAL

To change the interval setting for automatic BP measurements (default 3 minutes),

- Select 3 min, and then push the JOG DIAL to highlight in red.

- Turn the JOG DIAL to change the setting, and then push the JOG DIAL to set.

B. ALARM

The default setting for BP alarm is OFF. To turn on BP alarm,

- Select Alarm: OFF, and push the JOG DIAL to highlight in red.
- Turn the JOG DIAL to change to ON and then push the JOG DIAL to set.

C. CHANGE BP ALARM LIMITS

- Select the item to be changed, push the JOG DIAL to highlight in red.
- Turn the JOG DIAL to change the number, and push the JOG DIAL to set.

ECG

Select ECG in main menu and push the JOG DIAL to enter ECG submenu as below:

1. HI: 400
2. LO: 50
3. Gain: AUTO
4. Alarm: ON
5. RETURN
6. ESC

A. CHANGE HR ALARM LIMITS

- Select the item to be changed, push the JOG DIAL to highlight in red.
- Turn the JOG DIAL to change the number, and push the JOG DIAL to set.
- The new setting will be saved as default.

B. GAIN: AUTO

The ECG amplifier features automatic sensitivity adjustment. “GAIN: AUTO” indicates that the ECG amplifier will automatically adjust its sensitivities (gain) among six levels (X½, X1, X2, X4, X8, and X16) to display ECG in an optimal size (as large as possible without saturation). The red bar (10 mm high) displayed in the ECG channel provides a scale (mV) for measuring the amplitude of the ECG on the screen. To suspend the automatic sensitivity adjustment, change GAIN: AUTO to GAIN: CAL, the gain of the ECG amplifier will be fixed at X1.

SPO2

Select SPO2 in main menu and then push the JOG DIAL to enter as below:

1. HI: 100
2. LO: 90
3. Alarm: ON
4. RETURN
5. ESC

To change SpO2 alarm limits,

- Select the item to be changed, push the JOG DIAL to highlight in red.
- Turn the JOG DIAL to change the number, and push the JOG DIAL to set.

Temp.

Select Temp. in main menu and then push the JOG DIAL to enter as below:

1. Units: °F
2. HI: 105
3. LO: 95
4. Alarm: ON
5. RETURN
6. ESC

To change alarm limits,

- Select the item to be changed, push the JOG DIAL to highlight in red.
- Turn the JOG DIAL to change the number, and push the JOG DIAL to set.

SETUP

Select SETUP in main menu and push JOG DIAL to enter as below:

1. Date m. d. y

2. Time h: m: s
3. RETURN
4. ESC

To change the date and time,

- Select the item to be changed, and push the JOG DIAL to highlight in red.
- Turn the JOG DIAL to change setting, and push the JOG DIAL to set.

4.3 Recall Data

1. Recall BP readings

The VSM8 stores in its internal memory registered BP readings for up to 58 measurements. Push TREND key to display the BP readings. Turn the JOG DIAL to change pages. The VSM8 automatically calculates averages of the registered BP readings, and displays them at the top of the BP readings table.

Turning off the monitor or disconnecting the NIBP module from the monitor will erase all BP readings stored in the internal memory. However, the data already saved in the flash drive will not be deleted.

2. Recall trends

The VSM8 stores in its internal memory up to four hours of trends (HR, SpO2, Temp., RR, and CO2), and can display these trends in one-hour or four hour formats. Push TREND key to display the trends. Turn the JOG DIAL to switch between displaying the trends of the last one hour and displaying the trends of the last four hours.

4.4 Save Information

Plug the flash drive directly, or through the USB extension cable, to the USB port on the monitor. The VSM8 can not save information without the flash drive. The monitor displays DISK:None when no flash drive is plugged in.

A new folder will automatically be created on the flash drive upon entering a new patient name. The monitor will not save information on the flash drive until a name is entered.

1. Save information in monitoring mode

In monitoring mode, the monitor will save the information on the screen, i.e. make a screen capture, along with registered trends and BP readings, automatically every five minutes or when you push the SAVE key. For example, for a one-hour monitoring, at least 12 screen captures, along with a trends page and a BP readings page, will be saved in the folder of the patient on the flash drive. The number of saved screen captures is displayed at the bottom of the screen.

2. Save information in ECG mode

In ECG mode, the monitor automatically and continuously saves ECG on the flash drive. The monitor will automatically start saving ECG (screen captures) upon registering valid ECG, and automatically stop saving when ECG is no longer registered. Up to 99 screen captures can be saved continuously. The number of saved screen captures is displayed at the bottom of the screen.

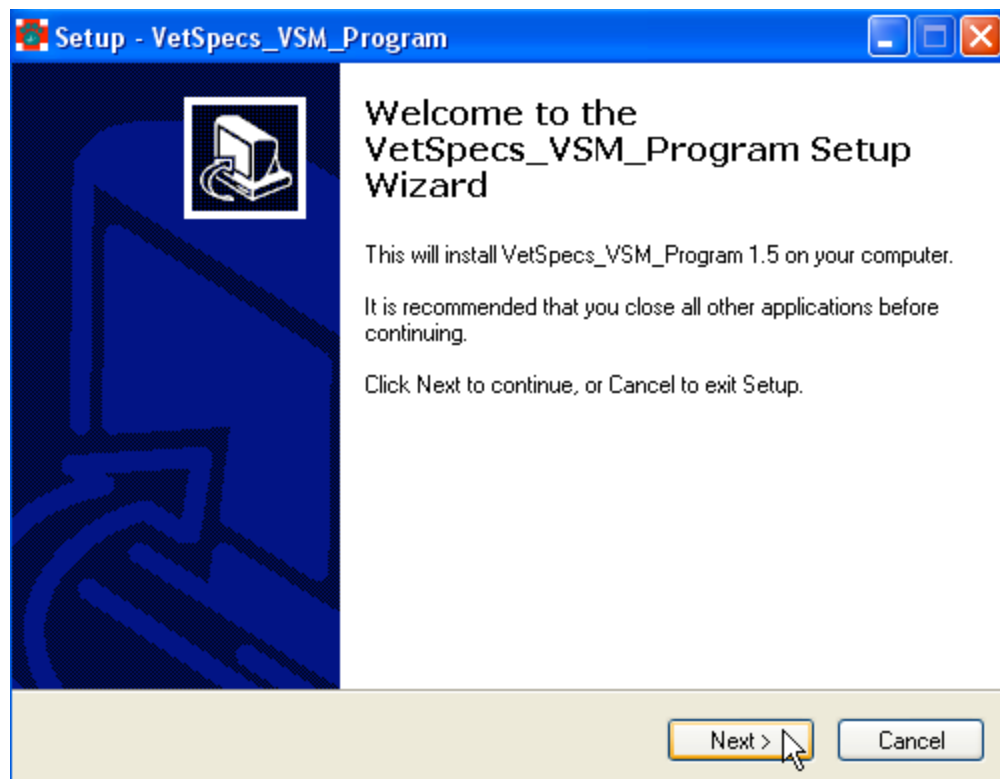
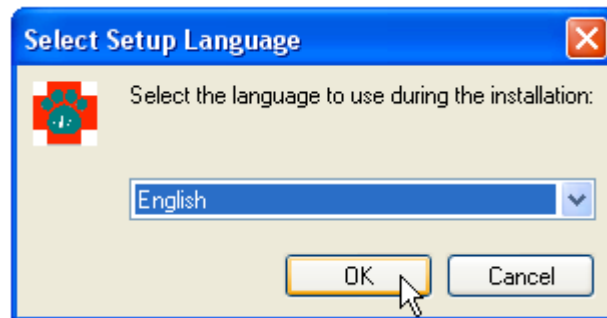
3. Save information in BP mode

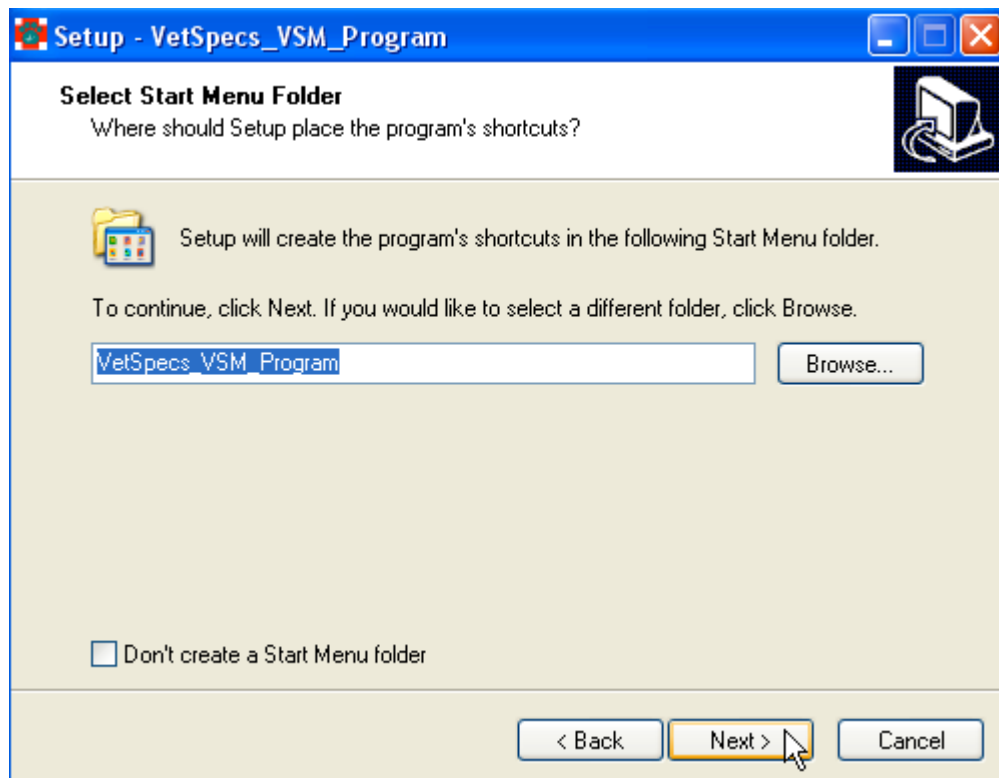
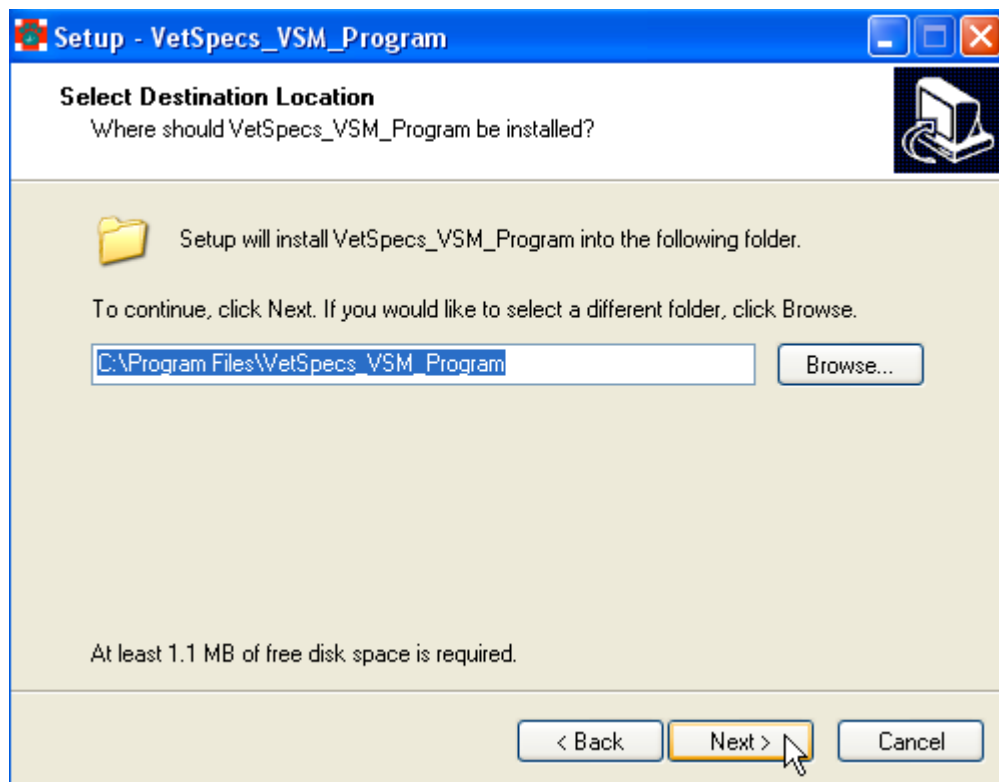
In BP mode, the monitor automatically saves on the flash drive readings registered in each measurement. Readings for up to 58 measurements, along with the averages of all measurements, will automatically be saved in the folder of the patient on the flash drive.

4.5 Review Saved Information

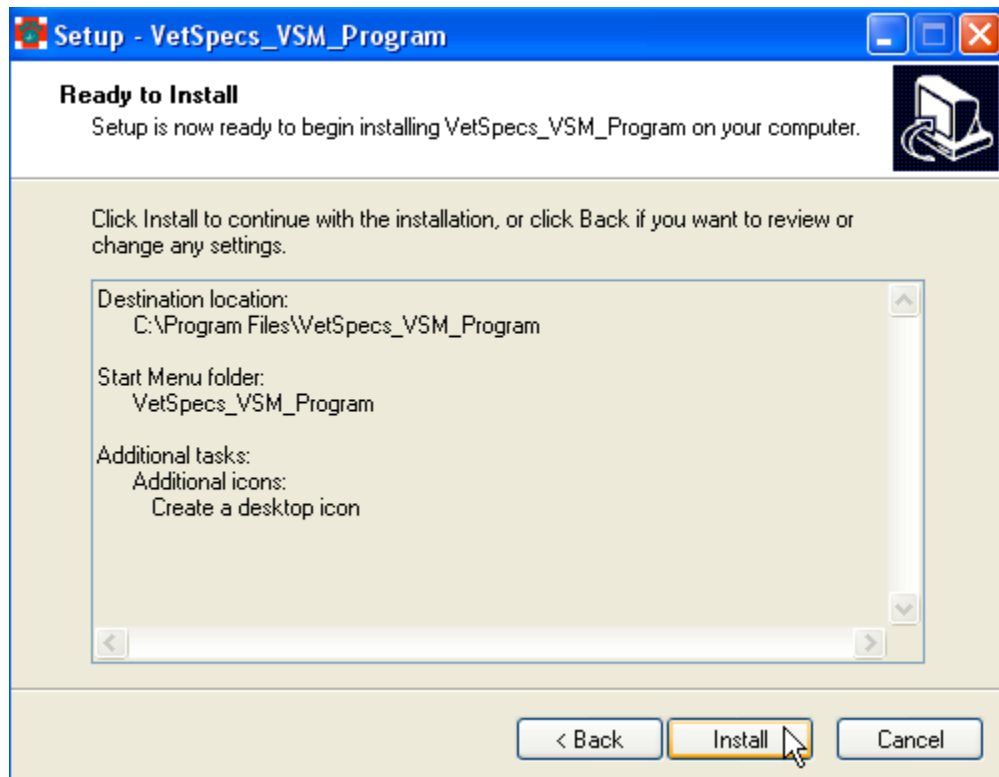
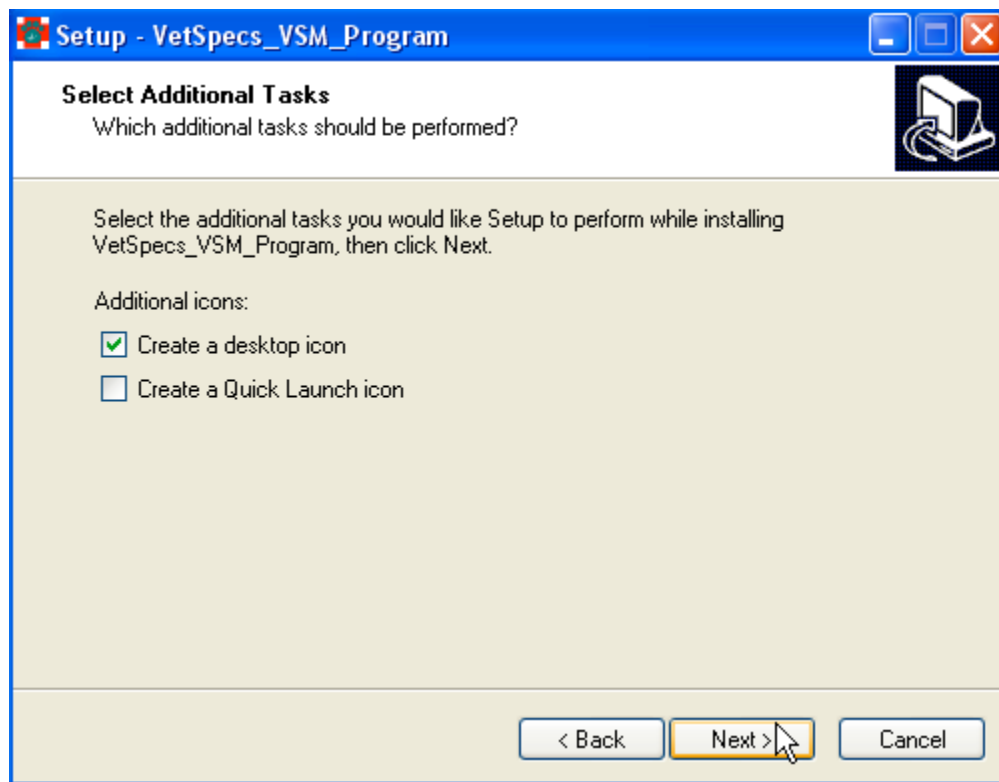
1. Install the software on computer

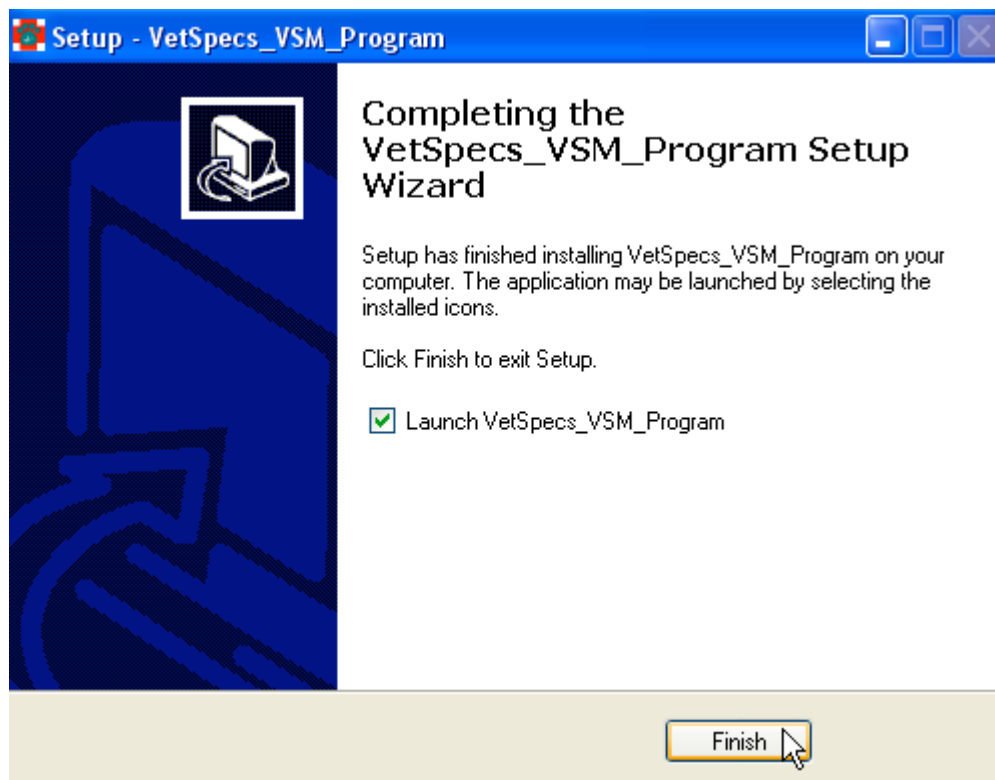
The VetSpecs program is compatible with all computers using Microsoft® Windows® XP operating system. Insert the software CD into a CD drive on the computer, and then open the CD. Double click the file “VetSpecs.exe” and then follow the steps below:



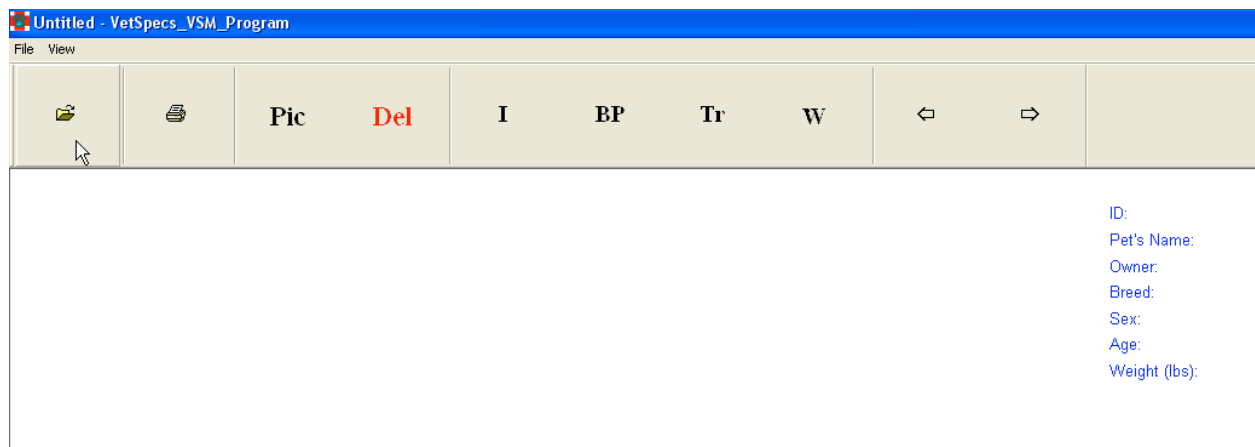


Check the box "Create a desktop icon" as below.





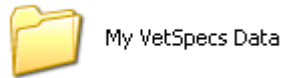
The window below pops up, indicating the program is opened up. To close the program, click the Close box as indicated by the cursor below.



2. Transfer data and organize files

A. Create a master folder on the hard drive

It is highly recommended to establish a new folder on the hard drive of your computer to be the master folder for storing all patient data recorded by the VSM8 before you ever start to transfer data to the computer. You can give any name to the master folder. For example, you can name it “My VetSpecs Data”.



B. Create a patient folder inside the master folder

Each patient should have a separate folder inside the master folder. You can literally create thousands of folders inside the master folder if necessary. Before you transfer any data of a new patient, you should create a new folder inside the master folder for the new patient. You should name all your patient folders in a way which allows you to identify them easily. For example, you may name a patient's folder with the patient's name and ID number as below:



C. Copy data files to the computer

Remove the flash drive from the VSM8, and insert it to a USB port on the computer. The flash drive should be recognized by the computer automatically, and indicated as Removable Disk under My Computer.

If you can not find the flash drive under My Computer window, try another USB port on the computer. If all USB ports are not working, try another computer. The USB flash drive is universally compatible with all computers with functional USB port(s).

It is suggested that you copy all folders on the flash drive to the computer as soon as possible, and then delete all folders on the flash drive. Otherwise, you may get confused as the time and the number of folders on the flash drive increase.

D. Rename data files

Immediately after these data folders are copied to the computer, you should move them into the folders of each patient involved, and then rename these data folders in a way that they can be identified easily. For example, the data folder of a surgical monitoring on July 1, 2005 is named as “SM-07-01-05”, the data folder of an ECG testing on July 1, 2005 is named as “ECG-07-01-05”, and the data folder of a BP screening on July 1, 2005 is named as “BP-07-01-05”, as shown below.



SM-07-01-05



ECG-07-01-05



BP-07-01-05

E. Organize patient files

All files for the same patient should be placed inside the patient's folder. For example, for patient Max with a patient ID number of 100002, all its files should be placed inside the folder 100002-Max as shown below.



100002-Max



SM-07-01-05



ECG-07-01-05



BP-07-01-05



ECG-07-01-06



BP-07-01-06



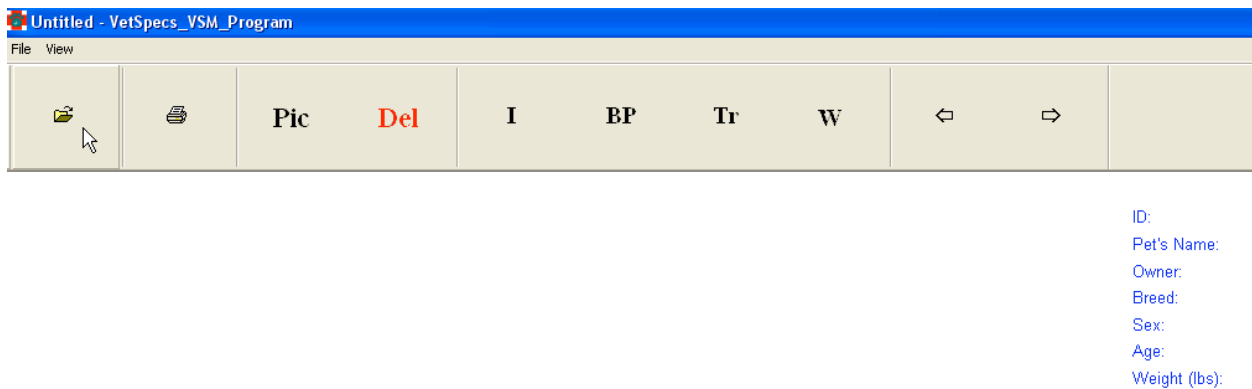
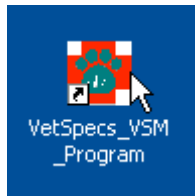
ECG-07-01-07



BP-07-01-07

3. Open the program

Double click the shortcut icon “VetSpecs_VSM_Program” on the desktop to open the program. A window titled VetSpecs Program pops up as shown below.



Click the File button, as shown above, or click File menu and select Open. Go to the data folder you want to open on the flash drive or hard drive.

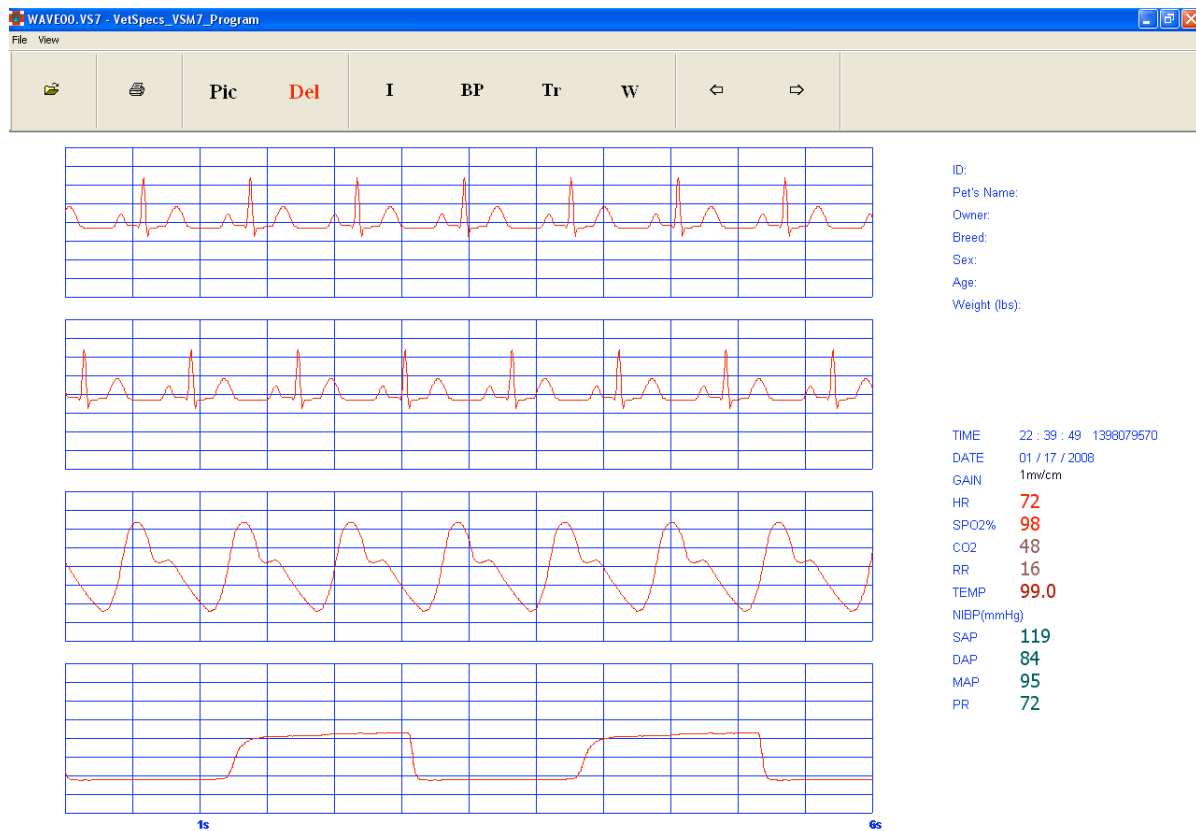
You can also directly go to the data folder you want to open on the flash drive or hard drive without the need to open the program first. See the next section.

4. View and print monitoring records

A. View screen captures

To view saved monitoring records, directly go to the data folder on the flash drive or the hard drive without the need to open the program first.

In the data folder, you will see screen captures WAVE00.VSM, WAVE01.VSM, WAVE02.VSM, WAVE03.VSM, trends page TREND.VSM, and BP readings BP_DATA.VSM. Double click any one of the screen captures, as shown below.



To turn pages, click the arrow buttons as shown below.

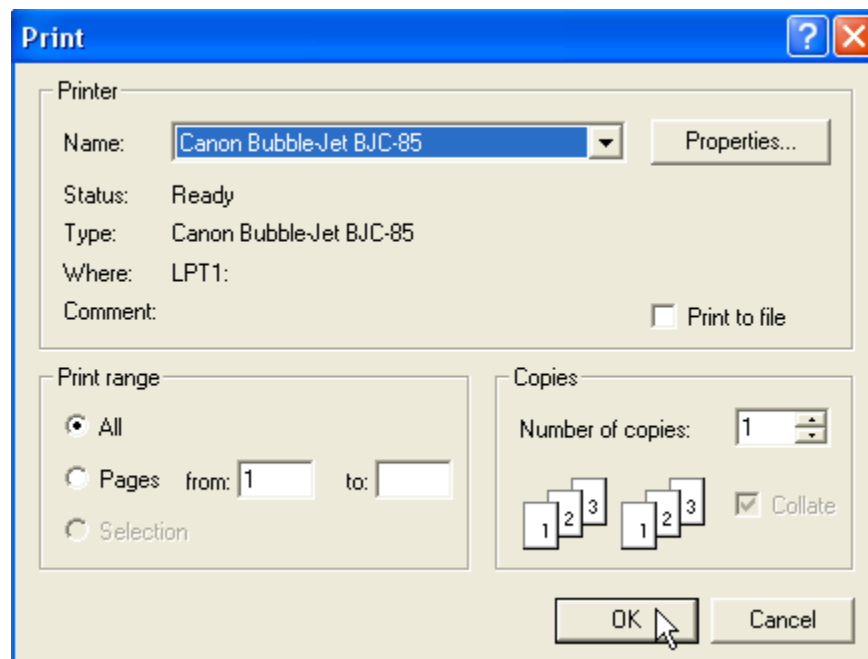


You can delete any screen captures which you do not want to keep. To delete a screen capture, click the red **Del** button as shown below.



B. Print screen captures

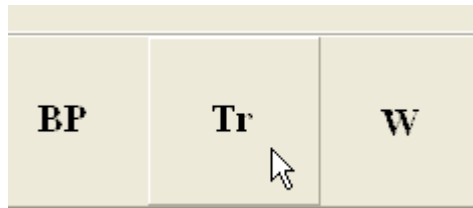
Click the button with a printer symbol (as shown below) or click File menu and select Print.... In the Print window, select the printer you want to use, and then click OK.



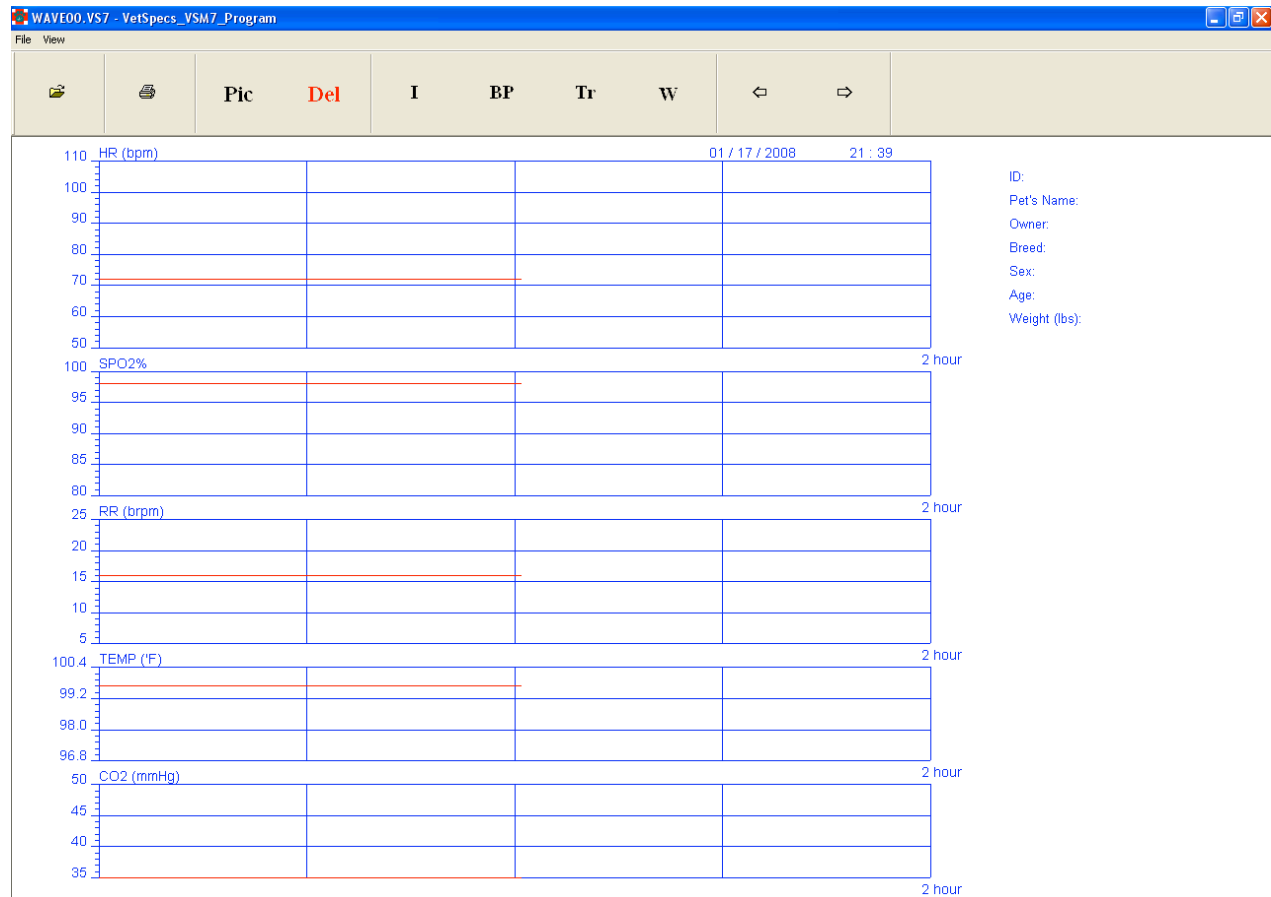
You can preview the printout before you print by simply clicking File menu and selecting Print Preview.

C. View and print trends

To view the trends page, click the **Tr** button as shown below.



The trends page opens up. To print the trends page, click the Print button.



D. View and print BP readings

To view recorded BP readings, click the **BP** button as shown below.



The BP readings table opens up as shown below. To print out, click the Print button.

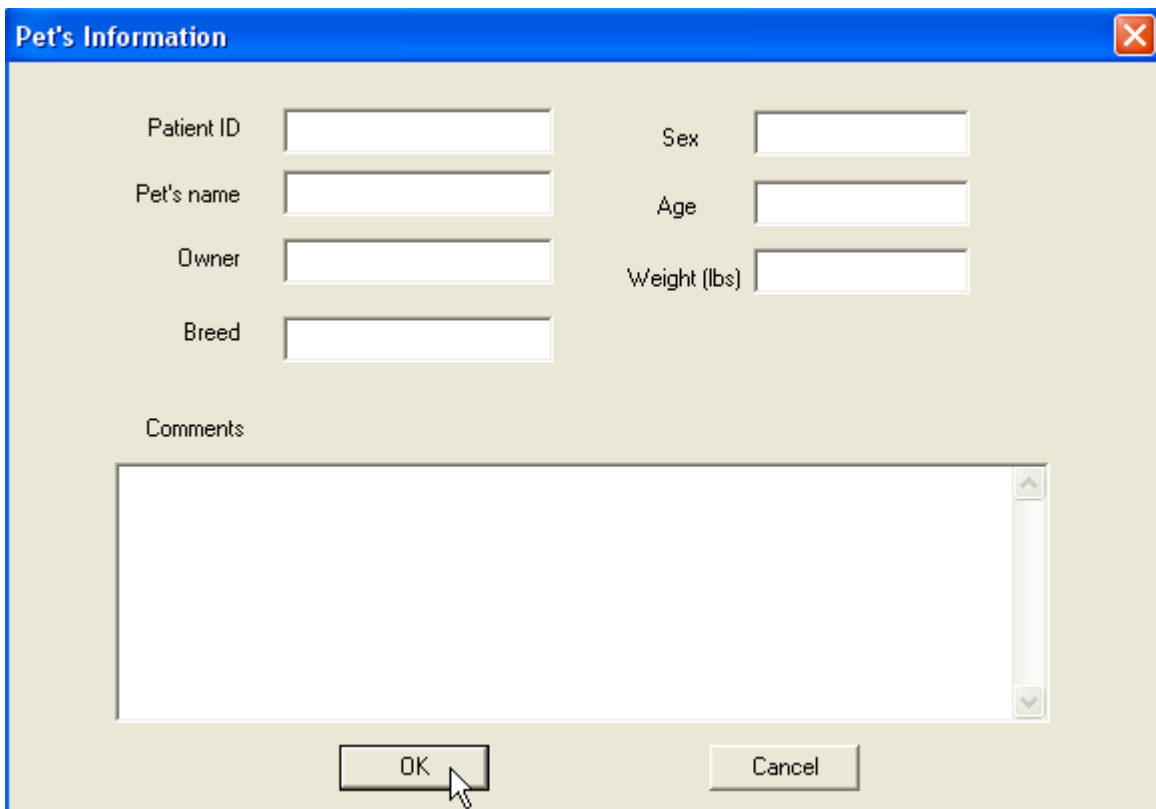
		Pic	Del	I	BP	Tr	W		
---	---	-----	-----	---	----	----	---	---	---

[illegible]

ID:
Pet's Name:
Owner:
Breed:
Sex:
Age:
Weight (lbs):



The Pet's Information window pops up, as shown below. Type in patient information and/or comments, and then click OK. You can update information at any time you want.

A screenshot of a software window titled "Pet's Information". The window has a blue title bar with a close button (X) in the top right corner. The main area is light beige and contains several input fields: "Patient ID", "Sex", "Pet's name", "Age", "Owner", "Weight (lbs)", and "Breed". Each field is a white rectangle with a thin border. Below these fields is a large white text area for "Comments" with a vertical scrollbar on the right. At the bottom of the window are two buttons: "OK" and "Cancel". A mouse cursor is pointing at the "OK" button.

When printing, the patient information will be printed on the top of each printout.

To review and print diagnostic comments, double click to open the file below.



PetInfo.VSM

F. Save as an independent picture

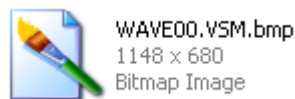
You can save screen captures, trends page, and BP readings page as independent pictures in bitmap (.bmp) format. These pictures can then be opened on any computer without using the VetSpecs® program. For example, you can email these pictures to anyone, and he or she will be able to open these pictures.

More importantly, this capability allows the data (monitoring records, ECG, and BP readings) to be integrated to existing patient files in your veterinary practice management program (software). All you need to do is to cut and paste these pictures (in bitmap format) to the patient's file folder under your practice management program, such as AVImark and Cornerstone.

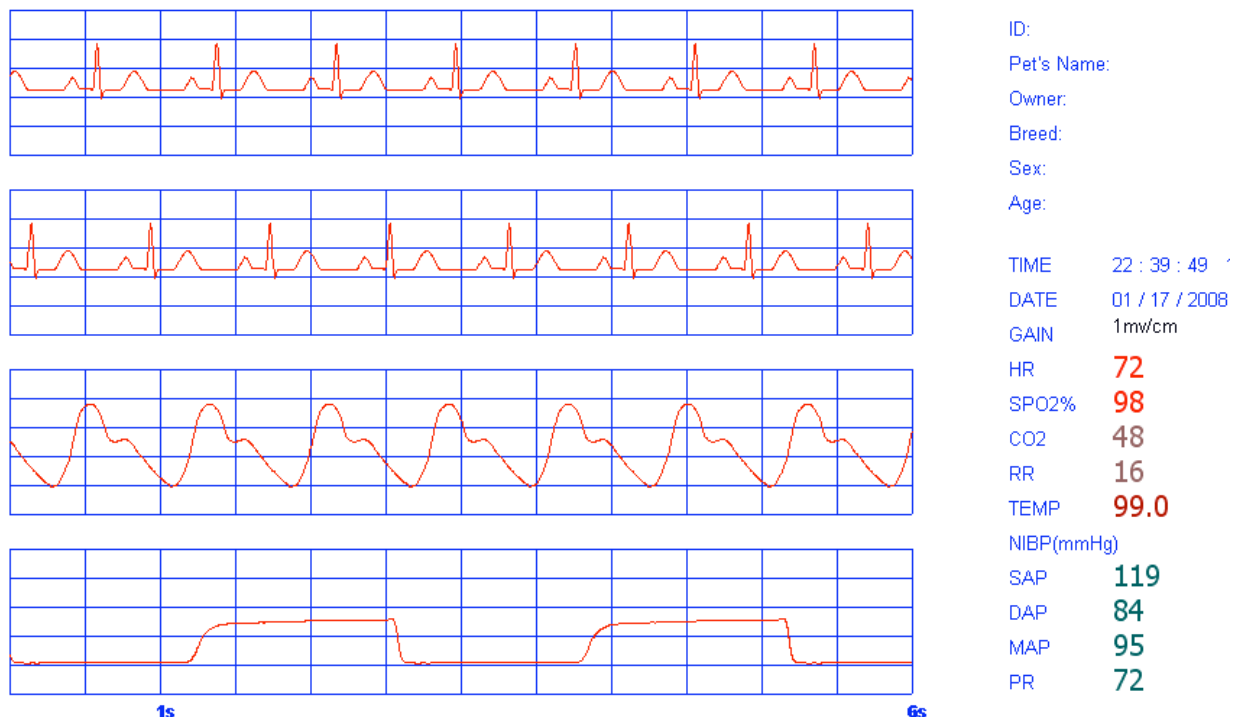
To save as an independent picture in bitmap format, click the **Pic** button and click OK.



As default, the bitmap picture is saved in the same original data folder, as shown below.

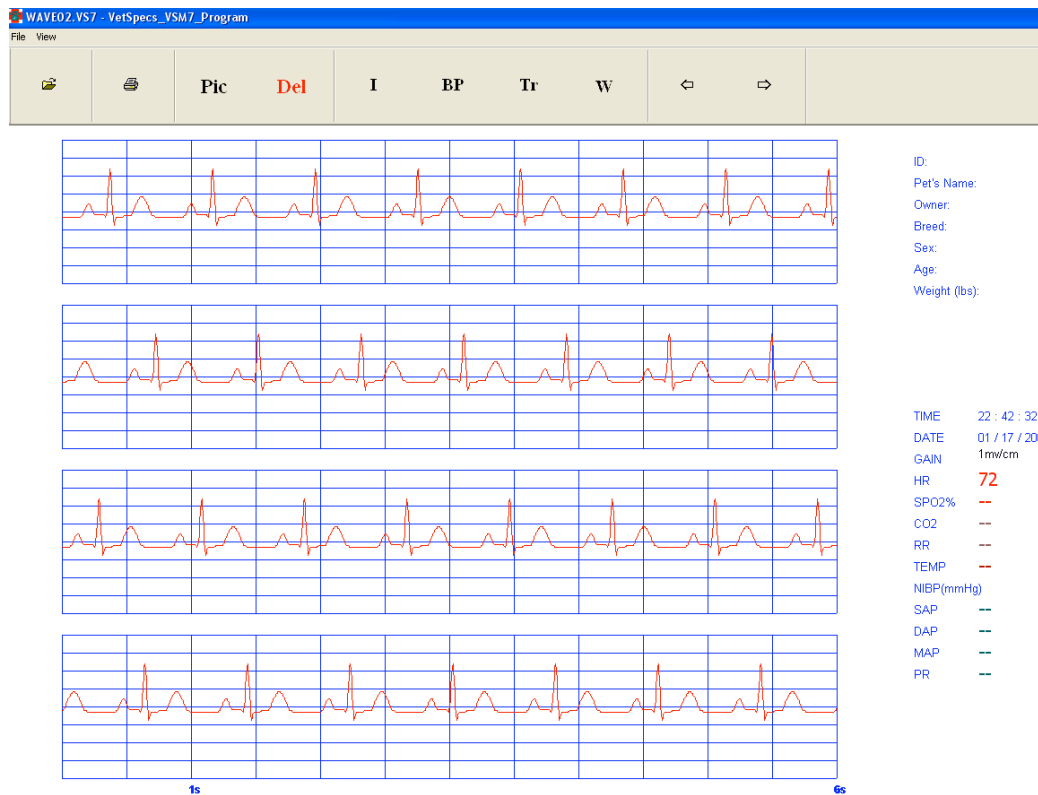


You can then move it to anywhere you want. To open the bitmap picture, simply double click the file. The picture is opened up as shown below.



5. View and print ECG

To review saved ECG, directly go to the data folder. Double click any one of the screen captures to open it up as shown below. To print, follow the same steps as above.



To save as an independent bitmap picture, follow the same steps as above.



4.6 Troubleshooting

1. ECG and Temperature

Problems	Possible Causes	Recommended Actions
After inserting an esophageal probe, the ECG is erratic.	Not all metal rings have established a good contact with the esophagus. The probe is inserted too shallow or deep.	1. Make sure an appropriate sized probe is used. 2. Adjust the position (depth) of the probe.
After inserting an esophageal probe, LEAD OFF is still displayed.	Wire(s) inside the probe may be damaged.	Try another probe.
After inserting an esophageal probe, no temperature is registered.	Wire(s) inside the probe may be damaged.	Try another probe.
When using the ECG leads with flat clips, ECG is erratic or having a lot of interference.	Good electrode-to-tissue contacts are not established.	Make sure that all three clips are applied to the patient properly and all three contact sites are soaked with saline.
LEAD OFF is still displayed after applying all three leads on the patient.	A lead (wire inside) was damaged.	Use another set of leads.
MODULE OFF is displayed when the Module is connected to the monitor.	The Module is malfunctioning.	The Module needs to be returned to manufacturer for service.

2. Pulse Oximetry

Problems	Possible Causes	Recommended Actions
PROBE OFF is displayed when a SpO2 sensor is connected to the Module.	A wire inside the SpO2 sensor was damaged.	Use another SpO2 sensor.
After applying the leg/toe sensor to the patient, the pulse waveforms are erratic or just a flat line.	No adequate light transmission due to dark hair, pigmented skin, and/or thick tissue.	1. Clip the hair on both sides. 2. Apply the sensor to a site with light skin.
After applying the lingual sensor, the pulse waveforms are erratic.	1. Low perfusion at the sensor site. 2. The sensor is malfunctioning.	1. Check the patient status. 2. Try the sensor on your finger. If the sensor works normally, try it again on the patient.

3. Airway-direct Respiration

Problems	Possible Causes	Recommended Actions
After inserting the airway sensor, the respiratory waveforms are a flat line.	Wire(s) inside the airway sensor may be damaged.	Test the airway sensor on yourself by breathing through it. If still no waveforms, the sensor needs to be replaced.

4. NIBP

Problems	Possible Causes	Recommended Actions
The NIBP module keeps inflating the cuff.	1. There is a leakage on the cuff. 2. There is a leakage on the tubing.	1. Try different cuffs. The cuffs are semi-disposable, and need to be replaced after using for a period of time. 2. Check the tubing.
The bar graph is erratic, and no PR is registered.	1. There are repetitive motions. 2. The sensor band is not working properly.	1. Calm down the patient, or eliminate motions being induced to the patient. 2. Test the sensor band on your finger, as instructed on page 15.
BP SENSOR OFF is still displayed after the sensor band is applied to the patient.	The sensor band may be worn out.	Tap on the sensor band. If BP SENSOR OFF does not go away, the sensor band needs to be replaced.
The bar graph is barely moving, and BP SENSOR OFF is displayed intermittently.	1. The perfusion at the sensor site is too weak. 2. The sensor band is not placed correctly. 3. The sensor band is not working normally.	1. Check the patient status. 2. Place the sensor band above a main artery and wrap it firmly. 3. Test the sensor band on your finger.
The bar graph is pulsating in synch with the heartbeats. However, no PR can be registered.	The NIBP module is malfunctioning.	Test on your finger. If still the same, the NIBP module needs to be serviced.
MODULE OFF is displayed when the NIBP module is connected to the monitor.	The NIBP module is malfunctioning.	The NIBP module needs to be returned to manufacturer for service.

5. Capnography

Problems	Possible Causes	Recommended Actions
CAL and CO2 calibration are not displayed after connecting the CO2 sensor to the monitor.	The CO2 sensor is malfunctioning.	The CO2 sensor needs to be returned to manufacturer for service.
After the CO2 sensor is inserted, CO2 waveforms stay a flat line.	The CO2 sensor is malfunctioning or not calibrated properly.	Re-calibrate the CO2 sensor, and then test it on yourself by breathing through it. If still the same, the CO2 sensor needs to be serviced.
The CO2 function is not working properly. The waveforms are erratic.	The airway adapter is dirty inside or damaged. The airway adapter can not be cleaned.	Insert another airway adapter, and then re-calibrate the CO2 sensor. The airway adapter is semi-disposable, and needs to be replaced frequently.

V. Maintenance

The monitor

Keep the monitor away from heat sources, liquid, flammable or corrosive materials, and direct sunshine. Avoid dusty, humid, or wet places. Always place the monitor on a stable and secure place. Do not block the ventilation vent.

Esophageal probes and ECG leads

Make sure to disconnect them from the Module prior to cleaning. Clean the esophageal probes and ECG leads with a paper towel wet with alcohol after each use.

SpO2 sensors and airway sensors

Make sure to disconnect the sensors from the Module prior to cleaning. Clean the sensors with a paper towel dampened with some water or liquid detergent. Do not wash the sensors or submerge them in liquid. Airway sensors are semi-disposable items.

BP sensor bands and cuffs

Make sure to disconnect the sensor bands and cuffs from the NIBP module prior to cleaning. Use a toothbrush to remove hairs from the Velcro strip on the sensor bands if necessary. Clean the cuffs with a paper towel wet with some water or liquid detergent. Do not wash the sensor bands or cuffs or submerge them in liquid. BP sensor bands and cuffs are semi-disposable items.

CO2 sensor and its airway adapter

Make sure to disconnect the sensor from the Module prior to cleaning. After each use, wipe the sensor and the airway adapter dry with a towel or paper towel. Do not detach the airway adapter from the sensor for cleaning. Do not try to clean the inside of the sensor and the airway adapter as it may damage the special optical film. Never use alcohol or any detergent to clean the CO2 sensor or the airway adapter. Do not wash the sensor and the airway adapter or submerge them in liquid. The airway adapter is semi-disposable, which needs to be replaced frequently in order to ensure a normal performance of the CO2 sensor.

Modules and accessories

Never modify any modules or accessories or use them on any other monitors which are not VetSpecs. Never use any cables, leads, probes, sensors, or cuffs, which are not provided by VetSpecs, on the VSM8 monitor. Never have the monitor or its modules and accessories serviced by any unauthorized person. Warranty for the monitor and its modules and accessories are voided if any of the above occurred.

VI. Accessories

VSM8-A:

One multi-parameter module, one Large Dog Esophageal Probe, one Small Dog Esophageal Probe, one Cat Esophageal Probe, one set of ECG Flat Clips, one SpO2 Lingual Sensor, one SpO2 Leg/toe Sensor, one Dog Airway Sensor, one Cat/Small Dog Airway Sensor, one USB flash drive, one USB extension cable, one power cord, one software CD, and one VSM8 User's Manual.

VSM8-B:

One multi-parameter module, one Large Dog Esophageal Probe, one Small Dog Esophageal Probe, one Cat Esophageal Probe, one set of ECG Flat Clips, one SpO2 Lingual Sensor, one SpO2 Leg/toe Sensor, one Dog Airway Sensor, one Cat/Small Dog Airway Sensor, one NIBP module with tubing, one Short BP Sensor Band, one Long BP Sensor Band, and six BP cuffs of different sizes, one USB flash drive, one USB extension cable, one power cord, one software CD, and one VSM8 User's Manual.

VSM8-C:

One multi-parameter module, one Large Dog Esophageal Probe, one Small Dog Esophageal Probe, one Cat Esophageal Probe, one set of ECG Flat Clips, one SpO2 Lingual Sensor, one SpO2 Leg/toe Sensor, one Mainstream CO2 Sensor attached with one clear airway adapter, one USB flash drive, one USB extension cable, one power cord, one software CD, and one VSM8 User's Manual.

VSM8-D:

One multi-parameter module, one Large Dog Esophageal Probe, one Small Dog Esophageal Probe, one Cat Esophageal Probe, one set of ECG Flat Clips, one SpO2 Lingual Sensor, one SpO2 Leg/toe Sensor, one Mainstream CO2 Sensor attached with one clear airway adapter, one NIBP module with tubing, one Short BP Sensor Band, one Long BP Sensor Band, and six BP cuffs of different sizes, one USB flash drive, one USB extension cable, one power cord, one software CD, and one VSM8 User's Manual.

VII. Technical Support



For customer or technical support or ordering accessories after purchasing the monitor,
please call

+(44) 0208 763 9777

For more information, please visit

www.YDTlimited.com

or write to info@ydtlimited.com

92 Hartley Down, Purley, Surrey, CR8 4EB, UK

Limited Warranty

VetSpecs, Inc. (“VetSpecs”) warrants the main unit of the VetSpecs® VSM8 Vital Signs Monitor (hereinafter “the VSM8 Main Unit”) to be free from defects in materials and workmanship, when stored under appropriate conditions and given normal, proper and intended usage, for two (2) years from the date of delivery of the VSM8 Main Unit to the original end user purchaser (“Buyer”). VetSpecs agrees during the applicable warranty period to repair or replace defective monitor without cost to Buyer. VetSpecs shall not have any obligation under this Limited Warranty to make replacements which result, in whole or in part, from catastrophe, fault or negligence of Buyer, or anyone claiming through or on behalf of Buyer, or from improper use of the VSM8 Main Unit, or use of the VSM8 Main Unit in a manner for which it was not designed, or by cause external to the VSM8 Main Unit.

The multi-parameter module, NIBP module, mainstream CO2 sensor, USB flash drive, and USB extension cable are covered by a 12-month limited warranty. The esophageal probes, ECG leads with flat clips, and SpO2 sensors are covered by a 6-month limited warranty. The airway sensors, BP sensor bands, cuffs, and airway adapter are semi-disposable items and have no warranty. The PC software is covered by a life-time replacement warranty.

Buyer shall notify VetSpecs of any product which it believes to be defective during the warranty period. Such product shall be returned by Buyer, transportation and insurance prepaid, to VetSpecs for examination and testing. VetSpecs shall repair or replace any such product found to be so defective and return such product to Buyer, transportation and insurance prepaid.

The provisions of the foregoing Limited Warranty are exclusive and are expressly in lieu of any other warranty, whether express or implied, written or oral. VetSpecs neither assumes nor authorizes any employee, agent, distributor or other person or entity to assume for it any other liability in connection with the manufacture, sale, supplying or use of the VSM8. VetSpecs’ liability arising out of the manufacture, sale or supplying of the VSM8 or its use or disposition, whether based upon warranty, contract, tort or otherwise, shall not exceed the actual purchase price paid by Buyer for the VSM8. In no event shall VetSpecs be liable to Buyer or any other person or entity for special, incidental or consequential damages (including, but not limited to, loss of profits, damages to properties, and injuries to the patient and/or the user) arising out of the manufacture, sale, supplying or use of the VSM8. The foregoing Limited Warranty extends to Buyer only and shall not be applicable to any other person or entity including, without limitation, customers of Buyer.